

FLIGHT

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**AIRCRAFT
ENGINEER
&
AIRSHIPS**

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

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DIARY OF FORTHCOMING EVENTS.

Club Secretaries and others desirous of announcing the date of important fixtures are invited to send particulars for inclusion in the following list:

| | |
|----------------|---|
| Nov. ... | Entrance Examination for R.A.F. College. |
| Dec. 3 ... | "The Air Force." Lecture by Air-Commodore H. R. Brooke-Popham before R.U.S.I. |
| Dec. 19 to ... | Paris Aero Show. |
| Jan. 4, 1920. | |
| July, 1920 | S.B.A.C. International Aero Exhibition at Olympia 1920 |
| Mar. 1 ... | Air Ministry Competition (Small Type Aero-planes) |
| Aug. 1 ... | Air Ministry Competition (Seaplanes) |
| Sept. 1 ... | Air Ministry Competition (Large Type Aero-planes) |

EDITORIAL COMMENT

THE Memorandum issued by Maj.-Genl. Sykes, Controller-General of Civil Aviation, which is published in full in another part of this issue of FLIGHT, in which he reviews the work of his department since May 1 last, when civil flying began, until the end of October, is a most interesting document. It indicates that civil flying has in the meantime made real and substantial progress,

and also that, within the limits of the organisation of which Gen. Sykes is the head, considerable encouragement is being given to the development of the movement. There is no attempt made in the Memorandum to forecast the future of civil aviation, though Gen. Sykes does express the belief that it possesses great potentialities, and that, given the requisite degrees of safety, reliability, comfort and economy, it must play an increasingly important part in the development of civilisation.

All this is quite easy to predicate, but the question is of how best civil aviation is to be kept alive during the period of growth. Gen. Sykes considers that it is essential that it should be kept going, and doubts at the same time whether the new industry is yet able to stand on its own feet. For our own part we have no doubts at all in the matter, nor have we hesitated to express our views that it most certainly cannot stand alone during the transition period. Gen. Sykes admits, as he would be the first to do, that when civilian aviation has developed it will be the main reserve of strength from which the R.A.F. will draw in times of stress. Obviously, without a healthy development of the civil side of flying this reserve of strength will be denied to the scheme of aerial defence, and we shall be faced by the two alternatives of keeping up a huge and costly fighting air service in times of peace, or of taking risks which would be absolutely criminal. The third and only sane alternative is the introduction immediately of an adequate scheme of encouragement of civil flying in order to ensure such a reserve as we have advocated in the past, and which is conceded as a necessity by Gen. Sykes himself. He suggests three methods of giving the necessary assistance, viz.:—

1. By means of direct Government subsidies, as in France.
2. By a Government grant to approved aerial transport companies for mileage and weight carried.
3. By the provision of certain "key" aerodromes and shed accommodation at home and on the Empire routes; and the collation and issue of information, including meteorological data, and the provision of communications.

As he points out, the problem is how best to tide over the difficult transition period through which we are passing. He thinks—and we agree—that adhesion to the British principle of independent private enterprise will be right eventually, but if a limited industry is to be maintained, as it must be to meet

the requirements of the R.A.F., it is for consideration whether it will not be necessary to adopt a combination of subsidies and grants for services rendered. To our way of thinking, it is not so much a matter for consideration as for immediate decision. The principle of encouragement has been passed by the Government long ago, and sufficient time should have elapsed by now for the formulation of a concrete scheme through which the principle can be applied. It would seem, on the face of it, that a combination of paragraphs (1) and (2) of the alternatives quoted above would best meet the case as it exists. The simple allocation of a grant to "approved" companies for mileage and weight carried is good, but it seems to us to be too restricted in its incidence. Manifestly it would be out of the question to subsidise every company or concern embarking on aerial transport, but at the same time it seems essential that some measure of support should be given to the industry as a whole. That is where (3) seems to come in, and we suggest, therefore, that a combination scheme, including the two, would probably be best.

The Safety of Flying

Not the least remarkable feature of the Memorandum is the light it sheds on the safety of flying as a means of transport. The table given in the Memorandum is exceedingly interesting, and will repay study by those who labour under the delusion that flying is unsafe. Briefly, it shows that the percentage of pilots killed is .095 per thousand flights, and of pilots injured .286 per thousand flights. No passengers were killed during the six months covered by the Memorandum, and the percentage injured was no more than .476 per thousand flights. These percentages have been taken because it is almost invariably in landing or taking off that accidents occur, and it is thus a better guide to assess them on the number of flights than to take mileage flown. As a matter of fact, the record shows that there was one death for each 151,500 miles flown, which is assuredly below the record of any other form of transport. We have not at hand the figures relating to railway or marine transport; but, speaking from recollection, the averages of killed work out very much higher than these. Therefore, we feel we are on safe ground when we claim that in so far as actual mileage traversed is concerned, flying has been actually demonstrated to be the safest form of transport. Taking another form of assessment, for every 5,200 passengers carried one has been injured, which again is a splendid record and one which should convince even the most sceptical that there is really nothing of the heroic in trusting oneself to aerial transport.

Another point that emerges from these statistics is that the regulations made by Gen. Sykes' department for the conduct of aerial navigation seem to have worked out very well. As we said at the time of their issue, they are drastic, and very rightly so. We cannot afford at this stage of the development of flight, when the public is looking to see whether it can be trusted or not, to have serious and avoidable accidents. It is far better that the regulations should err on the side of severity than that we should incur a series of accidents which might well retard development by years.

At the present moment what seems to be wanted in general is the declaration of a general policy towards civil flying. Two Committees have investigated the

subject. First of all there was the Civil Aerial Transport Committee, which enquired exhaustively into the prospects, and reported before the end of the War that civilian aviation ought to be afforded a substantial measure of support. The whole question was again enquired into by Lord Weir's Committee, which has reported to the Secretary of State for Air. How long it will be before that Report is issued as a public document we have no means of knowing, but it is to be hoped it will not be delayed a moment more than is necessary. The whole industry, and a very large section of the public outside, is waiting anxiously for a revelation of real policy.

General Seely's Resignation

For some time past it has been abundantly clear that the dual control exercised by the Secretary of State for War over his own special department, and the Air Ministry was not working as well as the Government assured us it would work. Now matters have, as we fully expected, come to a head, and Gen. Seely, who has filled the post of Under-Secretary for Air since the present Cabinet was formed, has resigned, and, what is more important than all, has given his reasons publicly for taking this inevitable course of action. He objects that subordination to the War Office is wasteful of time, of energy, and of money. By practically making the Air Ministry an annexe of the War Office the country is involved in a gigantic waste of commercial possibilities, and a waste of money on a great scale, by not taking advantage of the new inventions and of the new power the air has given to undertake our great and increased responsibilities in the world. Gen. Seely, after an experience of the working of this pernicious arrangement—one we have condemned from the first—has, like a man of honour, decided that he can no longer identify himself with a policy he feels to be inimical to the best interests of the country, and has taken the only possible course open to him of resigning.

We need not follow him through the convincing and straightforward explanatory speech he made in the House of Commons after his resignation. That is now a matter of past history, and what we are mostly concerned with is the future. Mr. Bonar Law, in his usual cynical way, affected to make light of the matter by describing it as a mere difference of opinion as between the Cabinet and Gen. Seely. That will not do. It has become quite clear as a result of the matters which led up to the resignation of the Under-Secretary that the Government has determined to make of the Air Ministry a mere appendage of the War Office. It is true that only the day before Gen. Seely's explanation the Leader of the House had given an explicit assurance that it was intended to maintain the unity of the Royal Air Force, but since Lord Weir's characteristic explanation before the Douglas-Pennant Committee of the difference between a Parliamentary and a truthful answer to a question, these assurances have less weight than ever. What, then, is the ultimate intention? The Government, it is quite apparent, does not propose to willingly appoint a Secretary of State for Air. Does it mean to institute a Ministry of Defence, and to group all three fighting Services together under a single Minister, with an Under-Secretary each for the Admiralty, War and Air? And if so, is Mr. Churchill to be the first tenant of the office? It is common knowledge that he, like



his father, is a strong believer in such an arrangement, and it will be interesting to know in the end if he has been able to impose his views on the Prime Minister, who seems to be singularly receptive of the ideas of other people.

We need not enter into a discussion of the merits of the single Ministry of Defence, especially as we set forth our views on the subject when the idea was first mooted some six months ago. There is the less reason in that there is bound to be a discussion on the points arising out of Gen. Seely's resignation. As a matter of fact, Lord Hugh Cecil asked that time should be given, and elicited a reply to the effect that if the House wished to debate the matter, the Government would give the necessary facilities—some time. Such a discussion must take place, for there are many aspects of Air Ministry affairs which require to have the light of day shed upon them, and this can only be done through the medium of such a discussion as that which we trust will be forced upon

the Government by the Air Party in the House of Commons.

Aerial Signposts

The official recommendations which were issued some time ago as to the desirability of indicating main-line stations for enabling passing airmen to verify their positions, seem to be bearing fruit. According to a "Notice to Airmen" issued by the Air Ministry, the roofs of the stations at Redhill, Tonbridge, Ashford (Kent), and Hitchin have now been marked with their names in large white letters. This is very much of a move in the right direction, and it is to be hoped, now that the railway companies are able to start seriously on the renovation of their large stations, that all the principal points along the main railway routes may soon be indicated in a similar manner. We say advisedly the principal points, for the reason that confusion might easily arise if the sign-posting idea were carried to too great a length.

Prohibited Areas

AN Air Ministry Order published on Tuesday evening announces that aircraft must not land in any prohibited area or fly over such area at a lower altitude than 6,000 feet.

The following places are specified as prohibited areas: Orkney Islands, Cromarty, Firth of Forth, Harwich, Osea Island, Sheerness, Chatham, Dover, Portsmouth, Poole Harbour, Portland, Devonport, Pembroke, and Cork Harbour.

The Airship Department

THE Air Ministry makes the following announcement:—

The Airship Department of the Admiralty has now been transferred to the control of the Air Council. All correspondence should, therefore, be addressed to the Secretary, Air Ministry, Kingsway, W.C.2, in future.

Licences Granted by the Air Ministry

THE Air Ministry has issued lists of licences issued to (1) Pilot, (2) Ground Engineers (Aircraft), and (3) Ground Engineers (Engines). The list of pilots contains 414 names, No. 1 being Capt. H. J. T. Saint; the ground engineers' (aircraft) list contains 243 names, while there are 256 included in the ground engineers' (engines) list. The lists show the types of aircraft for which the licence is granted, and they also give the date of expiry of the licences.

Co-operation with the U.S.

MAJ.-GEN. SEELY gave a small farewell luncheon at the House of Commons, on November 12, to Maj.-Gen. Sir F. H. Sykes, Controller-General of Civil Aviation, who is about to leave the country on a mission to the United States. Other guests included Mr. J. W. Davis (American Ambassador) and Air Marshal Sir Hugh Trenchard. Among the guests were the Marquess of Londonderry, Mr. Adamson (chairman of the Labour Party), Air-Commodore Maitland, Maj.-Gen. Swinton, Sir Arthur Robinson, Air-Commodore Lambe, Sir Archibald Sinclair, Maj. Hall, United States Air Attaché, Lieut.-Col. J. T. C. Moore-Brabazon, Mr. G. Holt Thomas, etc.

Maj.-Gen. Seely, proposing the health of the American Ambassador, said he would ask the Ambassador, in responding, to propose the health of Gen. Sykes, who was about to go to America at the invitation of Lord Grey in order to confer with the United States people in aviation matters, and to do his best to bring the two nations closer together.

Mr. Davis, in acknowledging the toast, said that he had learned that Gen. Sykes was making the visit to America at some personal sacrifice to himself. The visit was evidence of the deep earnestness with which he entered on the task. He was perfectly satisfied that the great majority of the people of both countries—those in official positions, and those, too, who were not—deep down in the bottom of their hearts longed for the co-operation of Great Britain and America, as they longed for no other thing in the international war. After all, faith without works was dead. He rejoiced in the fact that this mission opened a field of work and of labour which they entered upon together, and in which American co-operation, he thought, might be taken as assured. It was a very generous thing that the British Government should be willing to transfer to the United States one of the best, the largest, and most improved airships which it had built. No more striking testimony could have been given

to the earnestness of the desire on the part of the British to co-operate or of their confidence in American good faith.

Gen. Sykes said he went to America to try to help that co-operation which they had met with in France in the air, and in Paris in connection with the Conference there. In doing this they had very little to guide them, no established ground on which to work. If they could get, as they had tried to get in Paris, a broad principle on which to work, and thus meet the various needs of the States which had signed or would sign the Convention, they would be on the right road to help aerial efforts on really sound lines.

The Marquess of Londonderry, proposing the health of Gen. Seely, said that whatever Gen. Seely did in the future, he would always be followed with the affection and goodwill of those who had been connected with the air.

"My interest in the air is deep and abiding, and will last as long as I last," said Gen. Seely in reply. He added that he was indeed fortunate in the fact that his last official act as Vice-President of the Air Council was to have the privilege of entertaining the American Ambassador and Gen. Sykes in order further to cement the co-operation between this country and America in this and other matters.

Log-Books for Civilian Aviation

THE Air Ministry announces that, pending the production of aeroplane and engine log-books conforming to the International Air Convention, log-books of the type used by the Royal Air Force are on sale at 2s. net per copy.

These can be purchased through H.M. Stationery Office, Westminster, S.W., or through any bookseller.

Log-books conforming more closely to the requirements of the International Air Convention will be placed on sale as soon as possible.

An Air Board for India

IN furtherance of the policy announced in *FLIGHT* recently, an Air Board has been formed in India to advise the Commerce and Industry Department of the Government, which has charge of civil aviation.

Models

It will doubtless be welcome news to many of our readers in all parts of the world that we propose to resume the publication of the model section of *FLIGHT*. Arrangements have been completed by which contributions by the well-known writer on model aeroplanes, Mr. F. J. Camm, will appear exclusively in our columns. It is hoped that the first article by Mr. Camm will appear in our issue dated December 4.

Royal Society of Arts Lectures

AMONG the papers to be read before the Royal Society of Arts after Christmas is one on the "Commercial Future of Airships," by Air-Commodore E. M. Maitland, C.M.G., D.S.O., Three Cantor Lectures on "Aircraft Photography in War and Peace," will be given on January 19, 26 and February 2 by Capt. H. Hamshaw Thomas, M.B.E.

"Kite Balloons"

AT the next meeting of the Royal Aeronautical Society at the Royal Society of Arts on Wednesday, November 26, at 8 p.m., Mr. Griffith Brewer will give a lecture on "Some Kite Balloon Experiments." The chair will be taken by Air-Commodore E. M. Maitland, C.M.G., D.S.O., A.F.C., R.A.F.



SOUTHAMPTON PIER AND DOCKS: Photographed from a Supermarine flying boat

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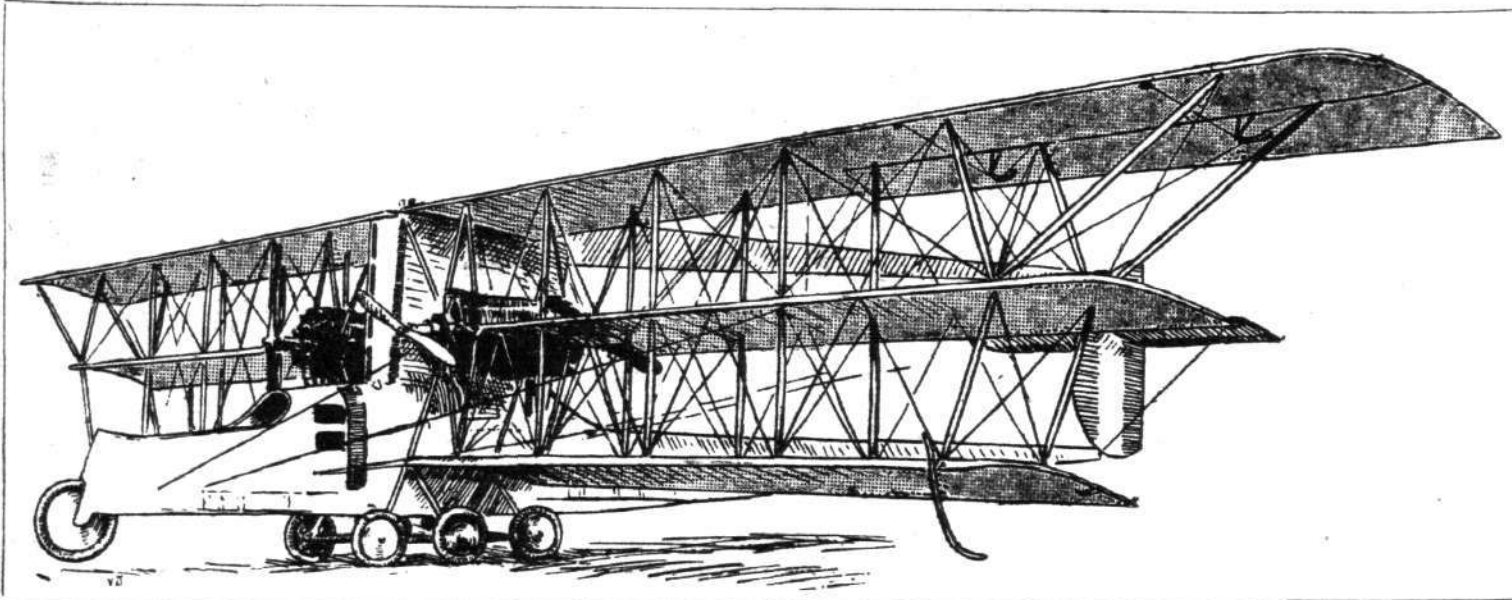


THE VOISIN EXPERIMENTAL BOMBING TRIPLANE

THE accompanying illustrations show an interesting French experimental bombing triplane constructed by the Voisin Co. The first model, which is shown in the sketch, was produced during the latter part of 1915, and was fitted with four engines of 150 h.p. each. As this first machine did not come up to expectations on its trials, another machine was constructed in 1916, similar in general design, but embodying many modifications.

construction and serving as an outrigger for the tail. There is also a cockpit in the fore part of the upper fuselage, where a gunner is stationed, from which position a very good range of fire is obtained. In conjunction with the gunner in the nose of the lower fuselage, and the rear gunner, who fires through an opening in the underside of this fuselage, the machine is well protected against attack.

The four Hispano-Suiza engines (220 h.p. each) are

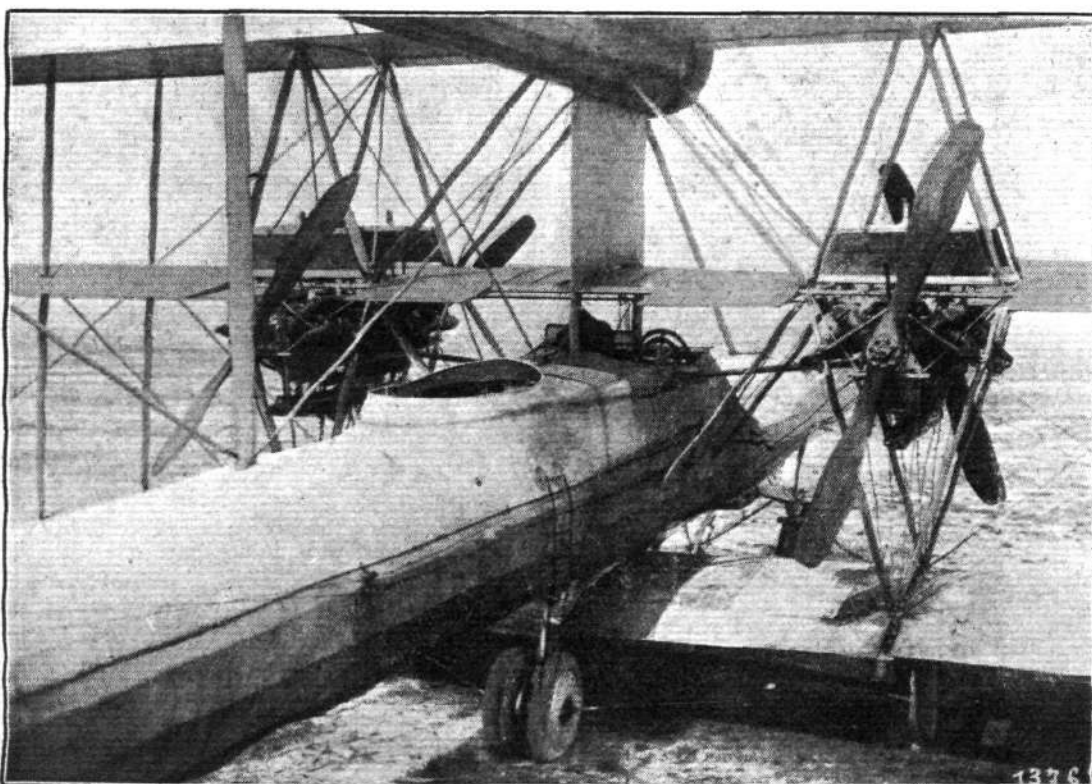


Sketch showing the first, 1915, model of the Voisin bombing triplane.

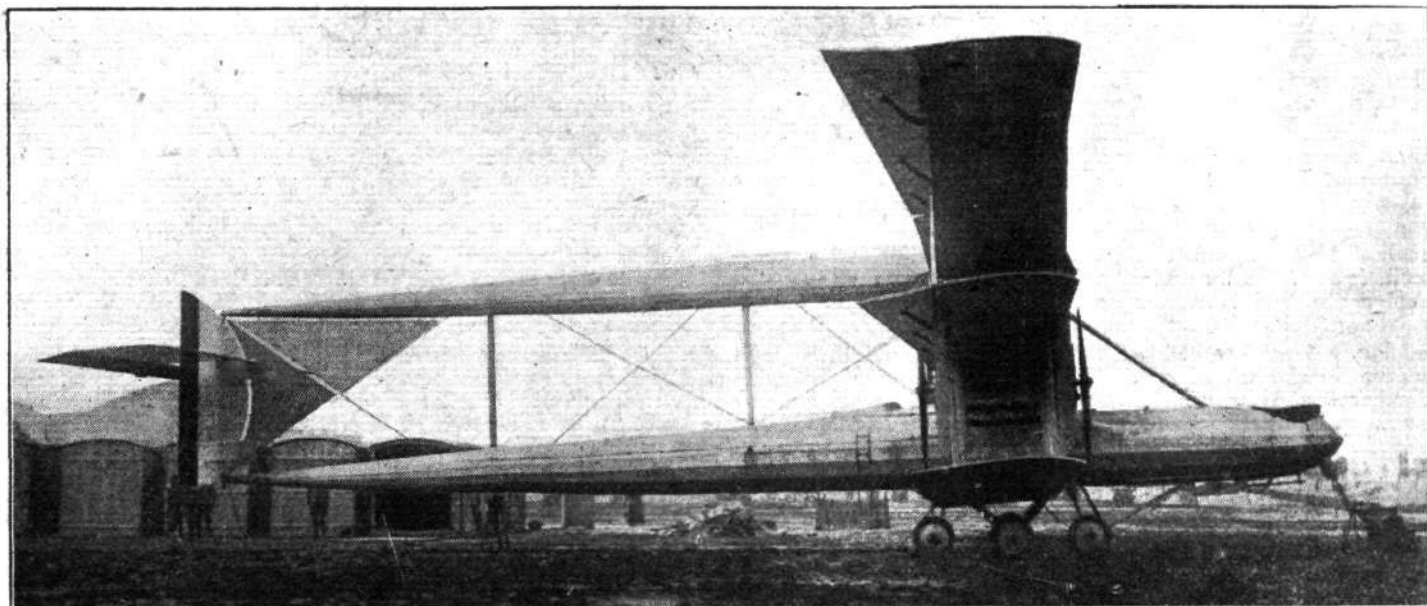
This machine is shown in our other illustrations, from which it will be seen that it possesses many distinctive characteristics. The most notable feature consists of the two fuselages, which, unlike those of other twin fuselage machines, such as the Caproni, are arranged one above the other, and not side by side. In both models the lower fuselage forms the main body, the upper fuselage being of much lighter

mounted in pairs in tandem, just below the middle plane in the 1916 model, on tubular V frames, extending from top to bottom planes. The engine mounting is additionally braced by diagonal struts from both upper and lower fuselages.

The overall span of the 1916 model is 118 ft., and the chord is 6 ft. 6 ins. The total surface is 2,150 sq. ft., and the loading is 7.1 lbs. per sq. ft.



Close-up view of the four Hispano-Suiza engines on the 1916 Voisin bombing triplane.



Side View of the 1916 Voisin Bombing Triplane

or 18 lbs. per h.p. The weight of the machine empty is 11,000 lbs., and the useful load is 4,400 lbs., of which half is accounted for by fuel, oil and crew. The speed at 6,500 ft. is 79 m.p.h., and the climb is 27

mins. for the 6,500 ft. The theoretical ceiling of this machine is 11,500 ft.



The Flight to Australia

It is with great regret that we have to record the fatal termination to the third attempt to fly to Australia for the Australian Government's prize of £10,000. The Alliance machine, fitted with 450 h.p. Napier engine, piloted by Lieut. Roger Douglas, M.C., with Lieut. J. S. L. Ross as navigator, left Hounslow at 11.33 a.m. on November 13. The machine passed over Teddington very low, and when over Surbiton it suddenly came out of the clouds in a spin and nose-dived to earth. Lieut. Douglas was killed instantaneously, and Lieut. Ross died in a few minutes after the accident. At the inquest on November 17 evidence was given which showed that the controls and the engine were in good order, and a verdict of "Accidental death" was returned.

Before starting the two officers had received the following messages:—

From Prince Albert: "May you have good luck in your sporting effort."

From Major-General J. E. B. Seely: "I wish you the best of luck on your sporting venture."

From Major-General Sir F. H. Sykes: "Success to your flight."

In our last issue we were able to briefly record the start of the Vickers-Vimy-Rolls-Royce machine from Hounslow on November 12. The weather on the coast was very misty and a heavy snow-cloud was encountered at Etaples. A safe landing was made at 3.40 p.m. at Lyon. The machine left Lyon at 10.6 a.m. the following morning, and in fine weather flew along the Riviera, across the Gulf of Genoa, landing at Pisa at 2.40 p.m. Bad weather had set in, but the machine was reported at Rome on November 17.

The following messages were received by the pilot, Capt. Ross-Smith, before starting:—

From PRINCE ALBERT.—"May good fortune attend you in your sporting attempt."

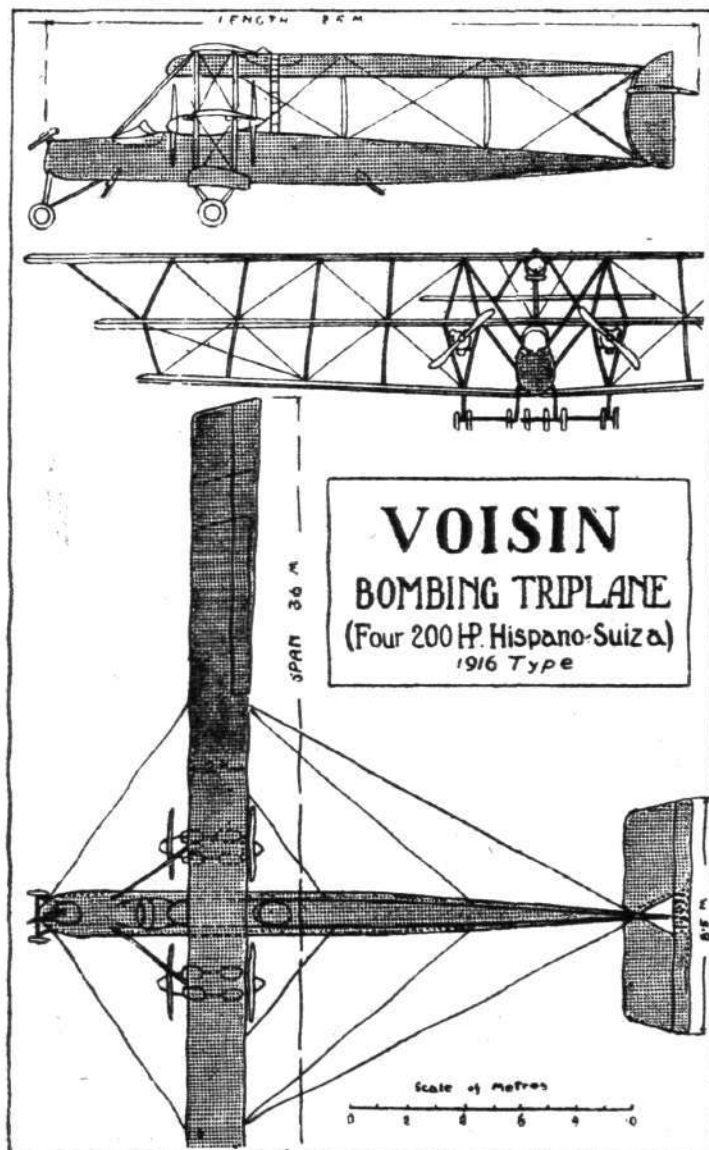
From Maj.-Gen. J. E. B. SEELY.—"I wish you all good luck in your sporting flight."

From Maj.-Gen. Sir F. H. SYKES.—"Best of luck in your great adventure."

Capt. Matthews, who is flying the Sopwith "Wallaby" to Australia, is still held up by bad weather at Gonzenheim, five miles from Mayence.

M. Poulet's Progress

ON November 11 M. Poulet, accompanied by M. Benoit, arrived at Karachi on his Caudron biplane at 3.30 p.m. He had left Gwadar at noon and landed on British military territory. The distance between Gwadar and Karachi is about 360 miles. On arrival M. Poulet was handed by M. Beaumont, the French Consul, a gift valued at £500.



THE VOISIN BOMBING TRIPLANE: Plan, side and front elevations to scale, of the modified type constructed in 1916

THE POSSIBILITIES OF FLYING HIGH

BY "MARCO POLO"

It is fairly certain that with the aeroplane as we know it to-day, no very great increase in performance can be expected. Wing sections have reached a high state of efficiency. Fuselages and other component parts exposed to the air have reached a stage where no very great decrease in resistance can be anticipated. Aero engines have been brought to such a pitch of perfection (or rather efficiency) as to weigh as little as 1½ lbs. for each horse-power developed. Structural design also has been greatly improved, resulting in a very light aeroplane, giving, in conjunction with the light, powerful engine, a very low loading per horse-power. Each of these factors in the equation of efficiency may be subject to still further improvements, but these cannot be expected to be of any very great magnitude, and as it is chiefly the loading per horse-power which determines the performance of an aeroplane, it follows that we are beginning to approach the high water mark. To this it may be objected that there is no practical need for better performance. So far as commercial aviation is concerned this may be true, for some time to come at any rate, but for military purposes the maximum performance will still be required. Also it is, unfortunately, a fact that the machine with the high performance is not very efficient as regards the load carried for a given horse-power. It would therefore appear that if some means could be found whereby the efficiency of a machine could be improved, or conversely, whereby the performance could be increased, the gain would be an advantage both to the commercial and to the military machine. Such a means, in fact, is found in flying at a great altitude and making provision for maintaining the engine power at this altitude.

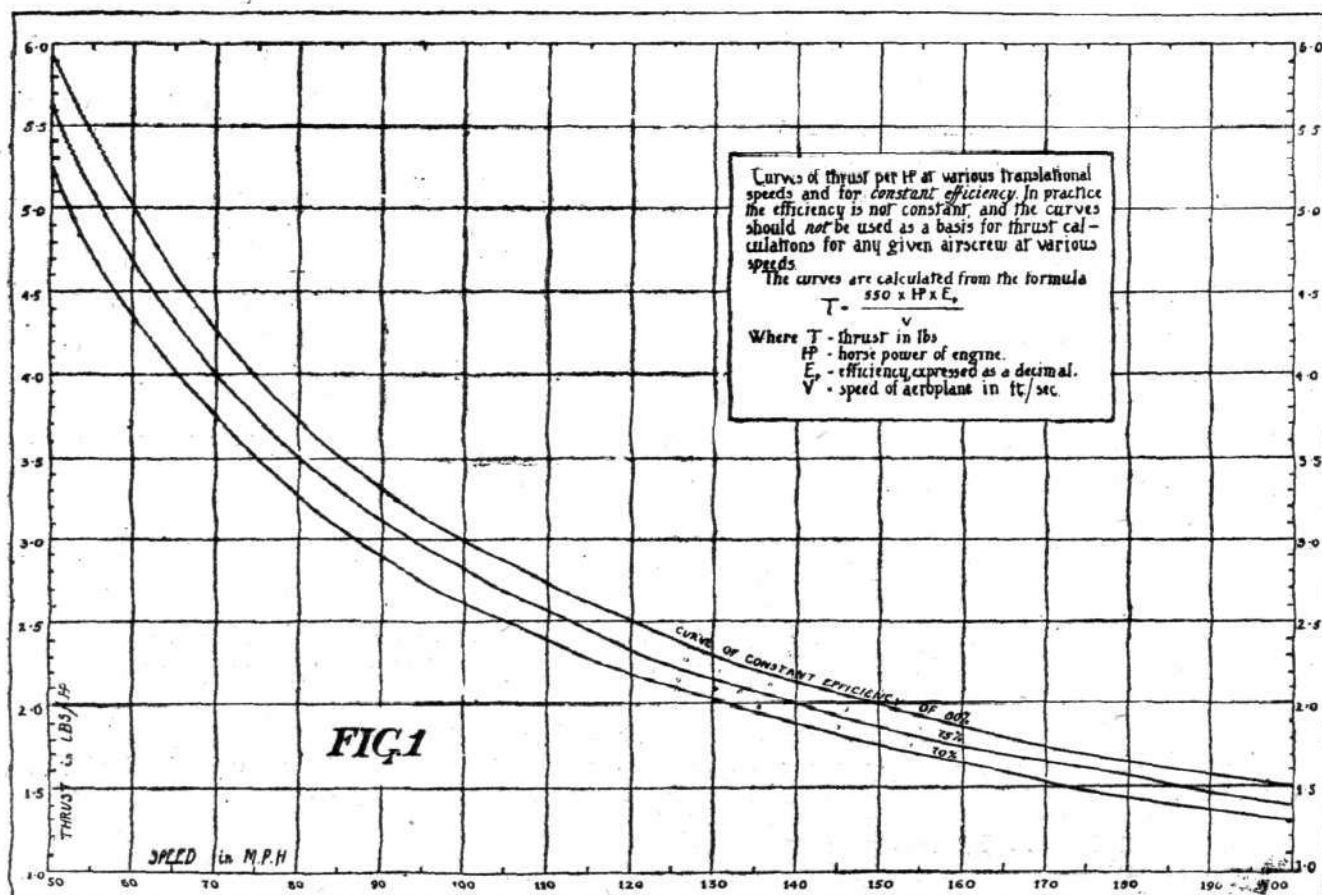
This fact is, of course, well realised, but it would appear that a full understanding of the fundamental principles involved is not shared by all interested in the subject.

Generally speaking, these may be divided into two groups; those who fail to see any utility in flying high, and those who, knowing less about the subject, reason somewhat as follows: At 20,000 ft. the density of the air is approximately half that at ground level; the resistance is therefore half, and the machine will be able to travel twice as fast. As usual in such cases, the truth is somewhere between the two extremes, and as the subject is one of considerable and increasing importance to commercial as well as military aviation, it is thought that a few notes dealing with the basic principles may not be without interest. In order to have the subject understood by all interested in aviation, the following notes have

been kept as elementary as possible, so as to keep the main principles quite clear, even at the expense of leaving out certain side issues which, although affecting the subject, do so to a small extent only. The notes, therefore, are not intended for those already well up in the subject, but for the student who is anxious to be able to follow more advanced articles on the subject.

It is a well-known fact that the density of the air decreases with altitude, the amount of decrease at any altitude varying according to the time of the year, etc. Thus at 20,000 ft. the density is on an average half that at ground level; at 30,000 ft. it is about one-third, and at 40,000 ft. about one-fourth. These figures are rough approximations only, and when, in the following notes, I refer to an altitude of 20,000, 30,000 and 40,000 ft. this should be taken merely as a convenient way of expressing the altitude at which the density is ½, ⅓ and ¼ that at ground level. The power of a petrol engine decreases with altitude, or in other words with the density of the air. This is, of course, due to the fact that, the petrol engine being a constant volume prime mover, although on each induction stroke the cylinders draw in the same volume of air, they do not draw in the same mass of air, owing to the rarefied condition of the air at great altitudes. This means that for each induction stroke a smaller mass of oxygen, which is the constituent of the air forming a combustible gas in conjunction with the petrol vapour, is drawn into the cylinders. As the proportion of petrol vapour to air—or to oxygen—is constant for perfect combustion it follows that with a smaller quantity of air the petrol supply must be reduced in order to avoid too rich a mixture. The consequence is that the power of the engine drops off, and it is found that the drop in power is very nearly proportional to the decrease in density. At 20,000 ft. therefore, the engine power will have dropped to about half of that developed at ground level. (Provided, of course, that the engine was designed to give its maximum power at ground level.) At the same time, owing to the density being halved, the lift of the wings has been halved, and to make up for this loss in lift the angle of incidence must be increased. This means increased resistance, and as there is now only half the power for overcoming this resistance, the speed is still further reduced.

It will, then, be quite clear that if it were possible to maintain the power at heights, the machine would be able to fly faster, since the resistance, other things being equal, is directly proportional to the density. Unfortunately, how-



ever, the lift also decreases directly as the density. The formula expressing the relation between the lift or drag of an aeroplane wing and the density of the air, speed of flight and wing area is:—

$$F = C_p A V^2 \quad (1)$$

where F = the force in whatever units of mass, length and time are employed; A = the area of the wings; ρ = the density of the air; V = the flight speed of the machine; and C is an "absolute" coefficient depending upon the shape of the wing section used.

If it is desired to obtain the value of F in pounds, and the flight speed is to be expressed in feet per second units, the value of ρ in above equation is 0.00238. If the speed is expressed in miles per hour and the force (lift or drag) F is required in pounds per square foot, the value of ρ is 0.0051. From the equation it will at once be seen that, the other factors remaining the same, the lift or resistance (drag) is directly proportional to the density.

We know that the resistance of an aeroplane varies as the square of the speed and *directly* as the density. It is therefore possible to formulate an expression showing the relationship between resistance (or lift), speed and density.

Let ρ_0 be the density at ground level.

Let V_0 be the speed at ground level; and let V_a be the speed at an altitude where the density is ρ_a ; clearly we can then write:—

$$\frac{V_a^2}{V_0^2} = \frac{\rho_0}{\rho_a}$$

from which

$$V_a^2 = \frac{V_0^2 \times \rho_0}{\rho_a}, \text{ and } V_a = \sqrt{\frac{V_0^2 \times \rho_0}{\rho_a}} = V_0 \sqrt{\frac{\rho_0}{\rho_a}} \quad (2)$$

To take an example.

Suppose the speed of a certain aeroplane is 100 m.p.h. at ground level. Then at 20,000 ft. (or, more correctly speaking, at an altitude where the density is half that at ground level) the value of ρ_a is 0.00255. Substituting these figures in (2)

we have $V_a = 100 \sqrt{\frac{\rho_0}{\rho_a}} = 100 \sqrt{\frac{0.0051}{0.00255}} = 100 \sqrt{2} = 141$.

This shows that at 20,000 ft. the speed at which the resistance (and the lift) is the same as that at 100 m.p.h. at ground level is 141 m.p.h., or an increase in speed of 41 per cent. At 40,000 ft. the speed for the same resistance would be $= 100 \sqrt{4} = 200$ m.p.h., or twice the speed attained at ground level. On the face of it, therefore, it would appear to be a comparatively simple matter to double the speeds attainable at ground level. Unfortunately this is not the case, for reasons to be pointed out hereafter. In order to understand clearly these reasons, it will be well to commence with fundamental

principles. One horse-power is equal to 33,000 ft.-lbs. per minute, or 550 ft.-lbs. per second. If, therefore, an aeroplane has a resistance of 550 lbs. at a speed of 1 ft. per second, it will require 1 h.p. to drive it at that speed, assuming an airscrew efficiency of 100 per cent. If, now, the speed is doubled—that is to say, increased to 2 ft./sec.—the resistance will be four times as great, since the resistance varies as the square of the speed. In other words, the resistance will be $550 \times 4 = 2,200$ lbs. This represents a horse-power of $\frac{2,200 \times 2}{550} = 8$.

We therefore see that while the resistance varies as V^2 , the horse-power varies as V^3 . A similar reasoning may be applied to the thrust of an airscrew. The horse-power delivered by an airscrew is compounded of two factors; the thrust and the "translational" speed. By translational speed is meant the forward and not the rotational speed. If, therefore, a propeller is giving a thrust of 550 lbs. at a translational speed of 1 ft./sec., it is delivering 1 h.p. If this propeller is mounted on an aeroplane fitted with an engine of 1 h.p. it is evidently giving 100 per cent. efficiency. If, now, the translational speed is doubled—that is, increased to 2 ft./sec.—the thrust will be halved, since otherwise thrust multiplied by translational speed would not equal 550 ft.-lbs. per second = 1 h.p. It is, therefore, seen that even when the engine power and the airscrew efficiency remain constant the thrust decreases with speed. As already mentioned, these figures relate to an airscrew of 100 per cent. efficiency. In practice such an efficiency is, of course, never attained.

From the foregoing it should be clear that we can write a formula giving the thrust in pounds of an airscrew of any efficiency and at any given translational speed. The thrust varies *directly* as the horse-power, *directly* as the efficiency and *inversely* as the translational speed. Clearly, therefore, the formula for thrust may be written:—

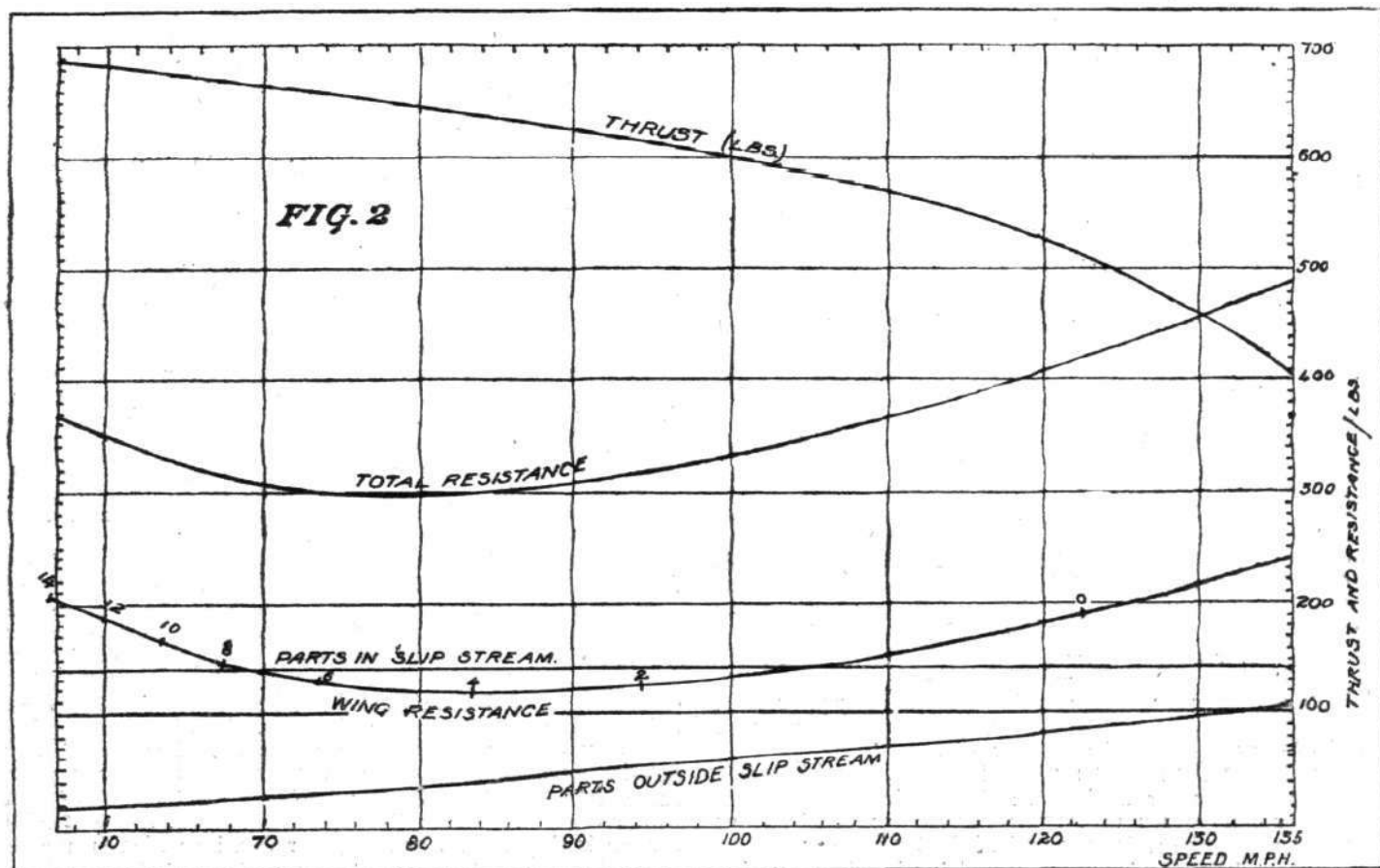
$$T = \frac{550 \times \text{h.p.} \times E_p}{V} \quad (3)$$

where T = thrust in lbs.,

h.p. = brake horse-power developed by engine,

E_p = the efficiency of the airscrew, expressed as a decimal, and V = the translational speed in ft./second.

It will be seen that the requirements set out above—that the thrust varies *directly* as the horse-power, *directly* as the efficiency, and *inversely* as the translational speed—have been met, since clearly if, in the formula, the horse-power is doubled the thrust will be doubled, or if the efficiency be doubled, the thrust will be doubled, or again that if the translational speed is doubled the thrust will be halved, since V is the denominator in the fraction.



From (3), it will be seen, it is possible to plot a series of curves giving the thrust per horse-power at various (constant) efficiencies and translational speeds. This has been done in Fig. 1, in which has been plotted the thrust per horse-power at efficiencies of 70 per cent., 75 per cent. and 80 per cent., and at translational speeds ranging from 50 m.p.h. to 200 m.p.h. It will be seen that for an airscrew of constant efficiency of 80 per cent. the thrust has dropped from 6 lbs./h.p. at 50 m.p.h. to 1.5 lbs./h.p. at 200 m.p.h. From (2) it was seen that to keep the resistance (and lift) the same as at ground level, the speed at 20,000 ft. was increased by 41 per cent. Also it has been shown that the horse-power required varies as the cube of the speed (when the efficiency remains constant). Owing to the decrease of thrust per horse-power with speed it is not possible to attain the speed indicated by (2). The speed which can be attained, on a basis of constant horse-power and efficiency, is indicated by a formula similar to (2), but in which cube root is substituted for square root (because the horse-power varies as the cube of the speed). This formula then becomes:—

$$V_a = V_o \sqrt[3]{\frac{\rho_o}{\rho_a}} \quad (4)$$

For constant power and efficiency, therefore, the speed attainable at 20,000 ft. with a machine doing 100 m.p.h. at ground level will be:—

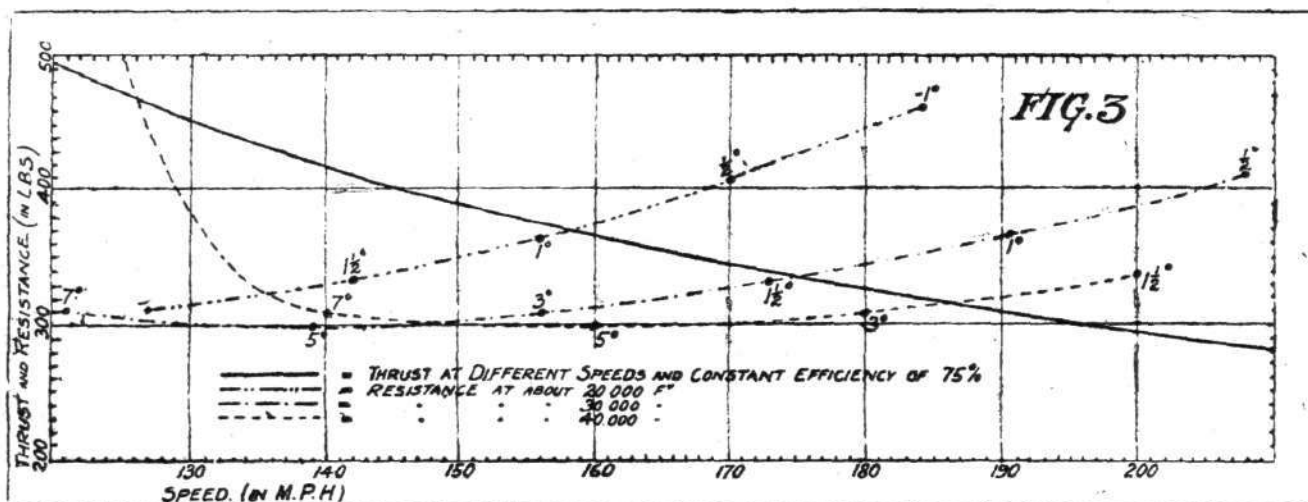
$$V_a = 100 \sqrt[3]{\frac{.0051}{.00255}} = 100 \sqrt[3]{2} = 100 \times 1.259 = 125.9 \text{ m.p.h.}$$

The increase obtainable on this basis is, therefore, 25.9

(2). Three such curves have been plotted in Fig. 3, for altitudes of 20,000, 30,000 and 40,000 ft., or, more correctly speaking, for altitudes at which the density is $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ that at ground level. These curves bring out several interesting facts. For instance, the speed has been increased from 130 m.p.h. to 158 m.p.h., equivalent to 21.5 per cent. At 30,000 ft. the increase in speed is from 130 m.p.h. to 175 m.p.h., or 34.6 per cent. At 40,000 ft. the maximum speed is 186 m.p.h., or 43 per cent. greater than that at ground level. This indicates that, other things being equal, the greater the altitude, the greater the gain in speed.

It has already been mentioned that to make up for the lift lost through not being able to attain the speed at which the lift is the same as that at ground level, the machine would have to fly at a greater angle of incidence. This is clearly brought out by the curves of Fig. 3. While the maximum speed at ground level (for straight, non-climbing flight, of course) had to be made at a slightly negative angle of incidence, at 20,000 ft. the angle is nearly 1° , at 30,000 ft. nearly $1\frac{1}{2}^\circ$, and at 40,000 ft. about $2\frac{1}{4}^\circ$. Purely from the point of view of the planes themselves, this is an advantage in making for greater economy, since the maximum L/D ratio usually occurs somewhere between 2° and 4° incidence. On the other hand, for flying at "cruising speeds"—that is to say, at speeds somewhat below the maximum—the angle of incidence would again be increased: in other words, would be greater than that corresponding to maximum L/D.

It will have been noticed that in the foregoing it has been assumed that the constant airscrew efficiency and the maintenance of power have been obtained without the addition



per cent. Even this speed, however, is not quite attainable, as a few minutes' consideration will show. The speed indicated by (2) is that at which the resistance (and therefore the lift, as both vary at the same rate) is the same as at ground level. It has been shown by (4) that this speed is not attainable, the figures for the necessary speed and the attainable speed being 141 m.p.h. and 125.9 m.p.h. respectively. Obviously this will mean that the aeroplane will have to make up for the loss of lift resulting from the lower speed by flying at a greater angle of incidence. For all ordinary machines this will mean a slight increase in resistance, so that even the speed indicated by (4) will not be attainable. The speed which is actually possible will vary according to the machine, and perhaps the best indication of what the loss in speed will amount to for a given machine may be given by a numerical example.

Fig. 2 shows the performance curves of a single-seater machine, weighing 2,100 lbs. "all on," with an area of 245 sq. ft., and having an engine developing 210 h.p. At ground level, it will be seen, the maximum speed is 130 m.p.h., and a landing speed of about 57 m.p.h. The maximum speed at ground level is only obtainable by flying at a slight negative angle of incidence. We will now imagine that this machine is fitted with means for maintaining both the horse-power and the airscrew efficiency. (The curve of thrust in Fig. 2 was plotted for an airscrew of ordinary type, of which the efficiency varies considerably with the speed). If it is assumed that the propeller efficiency remains constant at 75 per cent. and the horse-power at 210 h.p., we can plot, from (3) a curve of thrust in lbs. for various speeds. This has been done in Fig. 3 for speeds ranging from 120 m.p.h. to 210 m.p.h. From the curve of total resistance in Fig. 2 we can plot other curves for different altitudes (or densities) of speeds at which the resistance and lift is the same as that at the same angle of incidence at ground level, using equation

of extra weight. In practice this would not, of course, be so, and an allowance should be made for the extra weight of the supercharger—assuming such a machine to be employed for maintaining the power, and also for a certain loss of power utilised in driving the supercharger. After making such allowances, the speeds attainable would be somewhat lower than those indicated by the Chart, Fig. 3—how much lower would depend upon the efficiency of the means used for maintaining the power and the airscrew efficiency.

Another point which has to be taken into consideration is that at such great altitudes some provision would have to be made to enclose the pilot and passengers in an airtight cabin in which a pressure could be maintained equal to that at ground level. This again would add to the weight of the machine, and tend to reduce the speed. On the whole, therefore, it will be seen that there are numerous problems which have to be successfully tackled before any very great increases in flying speeds can be attained. The field is, however, one which offers great possibilities, and there is little doubt that in time some very good results will be obtained.

Broadly speaking, there are four distinct ways available for maintaining the power of an engine. The first is that of carrying a supply of oxygen, and using this to make up the deficiency in oxygen as the altitude increases. This method is scarcely likely to prove of great value, owing to the weight of the cylinders. The second consists in raising the compression of the engine and taking steps to prevent a full charge from being taken in while at low altitudes. The third method is that of "over-dimensioning," which will make for a slightly heavier engine. It is more than probable that the most successful method will be found to be a combination of high compression and over-dimensioning. Finally, the fourth system is that known as supercharging, by which is meant the maintenance of a constant pressure in the induction pipe,

equal to that at ground level. This may be accomplished in various ways. For instance, in the superchargers built in America, which follow the principle first suggested by Rateau, the energy of the exhaust gases, which would otherwise be lost, is partly recovered by means of a turbine, driven by the exhaust gases, driving a centrifugal blower which delivers air under pressure to the induction pipes of the engine. In Germany, on the other hand, experiments have been made

with centrifugal blowers driven direct by means of gearing from the engine. As yet it is not possible to say which method will prove superior, both having given promising results.

For multi-engined machines it would be possible to carry an auxiliary engine driving the blower supplying air to the main engines, and this also has, I believe, been tried in Germany.

HONOURS

It was announced in a supplement to the *London Gazette* on November 18, that the King has approved of the following rewards, conferred by the General Officer Commanding the North Russian Expeditionary Force:—

Distinguished Service Order

Squad. Leader (A./Wing Comdr.) **ROBIN GREY** (Gren. Gds.).

Commanded the R.A.F., Archangel Area, with great distinction. Owing to the lack of pilots and observers during the winter, he carried out personally the most dangerous reconnaissances. On April 8, 1919, at Obozerskaya, he carried out a reconnaissance in bad weather, bringing back valuable information. On April 22, he carried out two most important reconnaissances with success, but met with a bad accident on landing the second time. Although considerably shaken physically, he continued to command the R.A.F. with marked success until the conclusion of the operations in North Russia.

Flight-Lieut. **NORMAN GORDON STEWART-DAWSON, D.S.C.**

Successfully led several raids with great success during the operations with the "Syren" Force in North Russia from June to September, 1919, notably in the attack on the enemy at Kolkori on September 7. Flight-Lieut. Stewart-Dawson has displayed exceptionally good qualities in leadership during these operations in the air, and equally distinguished services in ground-work organisation, where the difficulties were many.

Bar to the D.F.C.

Observer-Officer **PARCELL REES BOWEN, M.C., D.F.C.** (5th Welsh R.).

On August 24, 1919, whilst observer on reconnaissance over the enemy aerodrome (Toima), he was fired upon at long distance range from an enemy machine, both himself and the pilot being wounded. The pilot having collapsed from his wound on to the controls, Observer-Officer Bowen managed to guide the machine from the back seat and flew homeward for a distance of 100 miles, by which time the pilot had slightly recovered and took control of the landing, which was safely made on the Bereznik Aerodrome. This officer's action was highly meritorious, and the guiding of the machine over a long distance was especially noteworthy in view of the wound which he had sustained in the right elbow.

Flying Officer **JOHN SHARPE GRIFFITH, D.F.C.**

Between May 5 and July 24, 1919, this officer carried out 40 bomb raids and reconnaissances, all with great success and generally from a low altitude. On June 3, 1919, he dived to within 100 ft. of the ground and destroyed an enemy balloon, as well as several of its attendants. When a two-seater machine was not readily available he fitted a camera to his scout, and, although it is very difficult to take photographs from such machines (and, moreover, he was inexperienced in such work), he succeeded in taking a very good mosaic which proved of great utility to the Commander of the Vologda Force. Flying Officer Griffith is an intrepid pilot and a very skilful all-round officer.

Flying Officer (A./Flight-Lieut.) **FREDERICK IVES LORD, D.F.C.**

On June 27, 1919, whilst piloting an R.E. 8 machine, he found the position of the enemy on the Pinega River, four versts from Pilegori, and attacked the moving columns from a height of 200 ft. with such effect that their transport was stampeded and their expected attack broke down, without any casualties being sustained by our forces.

Distinguished Flying Cross

Flying Officer **CYRIL ARTHUR BOUCHIER.**

A very skilful pilot of marked initiative and courage. Has been brought to notice on many occasions for the determination shown in his attacks. His methods are somewhat original. By flying low, parallel with and behind the enemy's lines, stampeding convoys and destroying wagons, he has caused the greatest confusion amongst the enemy to the great advantage of our own forces. Flying Officer Bouchier is a highly competent reconnaissance officer.

Flight-Lieut. **OLIVER CAMPBELL BRYSON, M.C., A.M.** (Dor. Yeo.).

Has commanded a squadron of heavy bombing machines in North Russia during the whole of the summer of 1919, during which period he carried out a large number of successful raids on the enemy's territory. During the operations on the Dwina in August, and on the Pinega in September, 1919, he flew a Snipe machine with exceptional skill and daring. A very gallant officer he has proved himself during these exceptionally difficult aerial operations.

Flight-Lieut. (A./Squad. Leader) **CHARLES RODERICK CARR.**

On June 17, 1919, this officer flew a scout machine over the enemy aerodrome at Puchega, at an average height of only 50 ft. for 30 minutes. During this time he succeeded in setting fire to a Nieuport enemy machine, to a hangar which contained three aeroplanes (all of which were destroyed), drove all the personnel off the aerodrome, and killed some of the mechanics.

Observer Officer **FREDERICK TALBOT EADES.**

On June 9, 1919, whilst serving with the "Syren" Force in North Russia, this officer was on night patrol (observer) in heavy rain, investigating the enemy's position off Schunga, on Lake Onega. Their position was attacked from a height of 300 ft. by machine gun and bombs, the latter being thrown from the observer's cockpit. Having expended all ammunition, the machine returned to base, and after refilling, again attacked and drove one gunboat ashore. A second gunboat was later seen to be in tow, presumably damaged in the attack. On the night of June 11 this officer was observer in the seaplane piloted by Flying Officer Isaac, when the enemy's line was twice cut, the machine sustaining considerable damage in the second attack.

Flying Officer **HAROLD ALFRED HAINES.**

During June and July, 1919, this officer performed numerous acts of gallantry in the operations of the "Syren" Force, North Russia. His work has been characterised by care and judgment, coupled with a total disregard of personal danger. He has taken part in numerous actions against the enemy from a very low altitude, and consequently at great risk, which resulted in the infliction of heavy casualties and great damage being done to the enemy's rolling stock, ships, and bridges.

Pilot Officer **BERNARD ALLEN HEENEY.**

During the entire winter in North Russia this observer officer flew almost continuously over the enemy's lines on reconnaissance duties, under very arduous and dangerous circumstances. Pilot Officer Heenev was severely wounded on June 20, 1919, whilst flying very low, assisting our Allied troops.

Flying Officer **FREDERICK HARRY ISAAC.**

On June 11, 1919, whilst serving with the "Syren" Force in North Russia, this pilot was on patrol endeavouring to prevent reinforcements from reaching the enemy's front; he descended to within 50 ft. of the ground, and, whilst exposed to heavy fire, succeeded in cutting their line, with bombs. During the night the enemy repaired the line, and Pilot Isaac on hearing of this proceeded to the scene and again destroyed it from a height of only 30 ft., his machine sustaining heavy damage from the enemy's fire, as well as from his own bombs. The gallantry and determination of this officer will be more readily appreciated when it is borne in mind that his machine was a seaplane, operating seven miles inland.

Flying Officer **ARTHUR EDWARD LETTINGTON.**

During the operations of the "Syren" Force in North Russia, from July to September, 1919, this pilot has proved himself a gallant officer, with marked ability and initiative. In machine-gunning the enemy from very low altitudes he has met with signal success. On August 3, 1919, in co-operation with our Lake Flotilla off Tolvuya, he descended and attacked the enemy quite near the water, in the face of concentrated machine-gun fire, which resulted in the capture of the town and three of the enemy steamers. Many other instances are recorded wherein this officer displayed gallantry of a high order in circumstances of great difficulty.

Flying Officer **LLOYD WESLEY MASON.**

This officer has shown great dash and courage whilst flying a Snipe at extremely low altitudes. He has taken part in operations throughout the summer both on the Dwina and Railway Fronts, and has attacked many targets with his machine guns, dispersing troops and breaking up counter-attacks. In an attack on Puchega Aerodrome he descended very near the ground in an endeavour to silence machine guns which were concentrating on his squadron-commander's machine.

Flight-Lieut. **ALFRED PRICE MAURICE.**

Commanded the R.A.F. unit at Obozerskaya since May 5, 1919, with marked success, proving himself a most capable and reliable officer adapting himself readily to the unusual and often unfavourable conditions. Flight-Lieut. Maurice has constantly carried out reconnaissances over the enemy's lines in dangerous circumstances, and has conducted bomb raids from low levels, notwithstanding the strong opposition from the enemy's anti-aircraft guns and machine guns.

Flying Officer **JOHN PERCIVAL MORKAM** (Northants R.).

For more than six months, including the coldest and most inclement portion of the Arctic winter, this officer has displayed marked qualities of good leadership. In May, 1919, great efforts were made to prepare a forward summer aerodrome, but not with much success, and owing to the unsuitability of the available machines all attempts to rise from it failed—in one of these attempts at rising Flying Officer Morkam's machine was smashed and he himself severely injured. Notwithstanding these difficulties this officer, under urgent necessity, voluntarily undertook a reconnaissance flight of three hours over unknown and unmapped country, and returned with very valuable information, his petrol being absolutely exhausted on alighting. The nature of the country is such that no landing was possible anywhere on the return journey until his own base was reached. ("Syren" Force, North Russia.)

Flight-Lieut. **WALTER HENRY PARK, M.C.**

An exceptionally good pilot who has displayed marked ability and courage during the operations with the "Syren" Force in North Russia. His service flights have been specially praised on six occasions by the Commander of the Forces during a period of three months, and his determination in pressing home the attacks on the enemy contributed in a large measure to the success which attended the work of the Air Force.

Observer Officer **EDWARD ERIC SPENCER WHEATLEY (R.A.).**

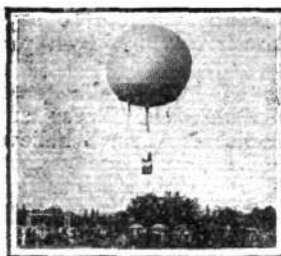
Has rendered valuable services in artillery observation from low altitudes, having been mentioned several times for this work. During the operations on the Dwina in June, 1919, he carried out many contact patrols, flying very low over the heads of the enemy, keeping our headquarters constantly and accurately informed as to the position.

Distinguished Flying Medal

No. 207177 Sergt. **CHARLES VICTOR ROBINSON**, late 205th Squadron, R.A.F. (France).

On May 18, 1918, whilst acting as observer in a bombing attack on Chaulnes Railway Junction, his formation was attacked by seven enemy scouts. His machine was attacked simultaneously by two of these, one of which he shot down in flames. On the previous day he dropped a 112-lb. bomb on this junction, causing a great conflagration. Sergt. Robinson has carried out 100 successful bombing raids, and is a most reliable observer.

The King has approved of the award of the Military Medal for bravery in the field to No. 26712 Flight Sergt. **EDWARD WARDELL** (Putney), R.A.F., for gallantry in numerous actions extending from June, 1917, to the close of the War.



AIRSHIPS



AIRSHIP ENGINEERING PROGRESS IN THE UNITED STATES

By J. C. HUNSAKER, Eng. D., Commander, Construction Corps, U.S. Navy

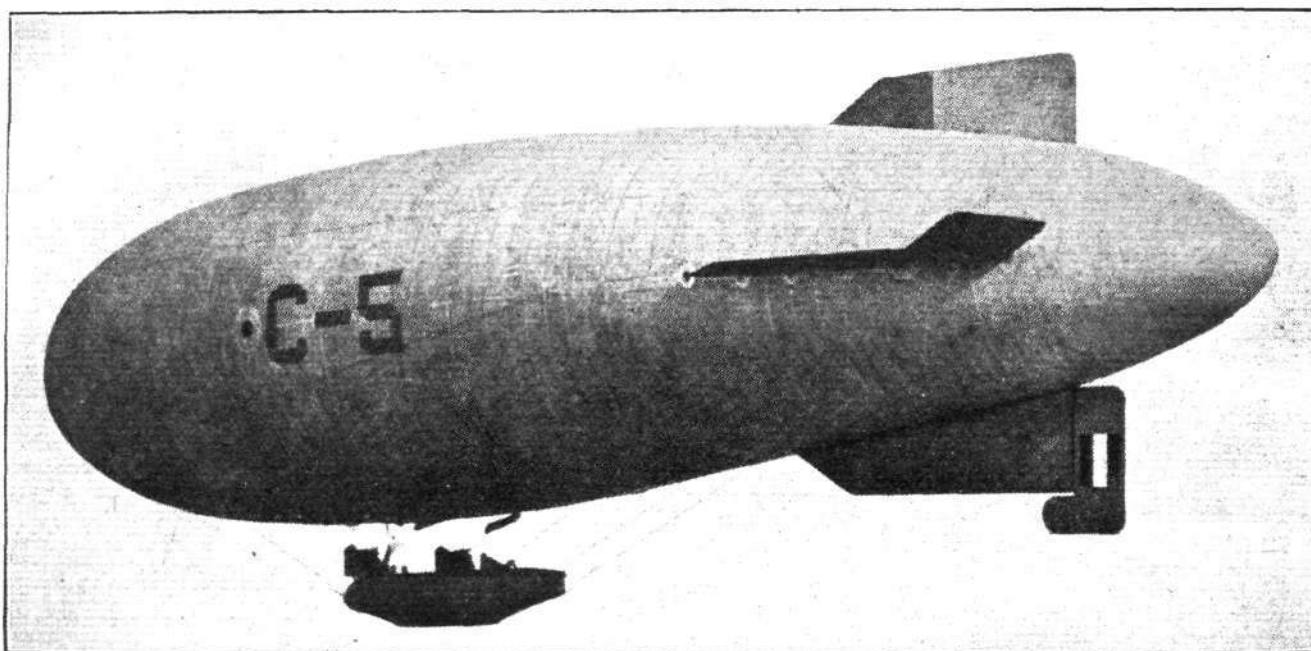
(Concluded from page 1477)

Construction of Rigid Airships

THE employment of Zeppelins by the Germans for naval purposes was so successful that it was obviously necessary

that all of the materials required would be available when the proper time came.

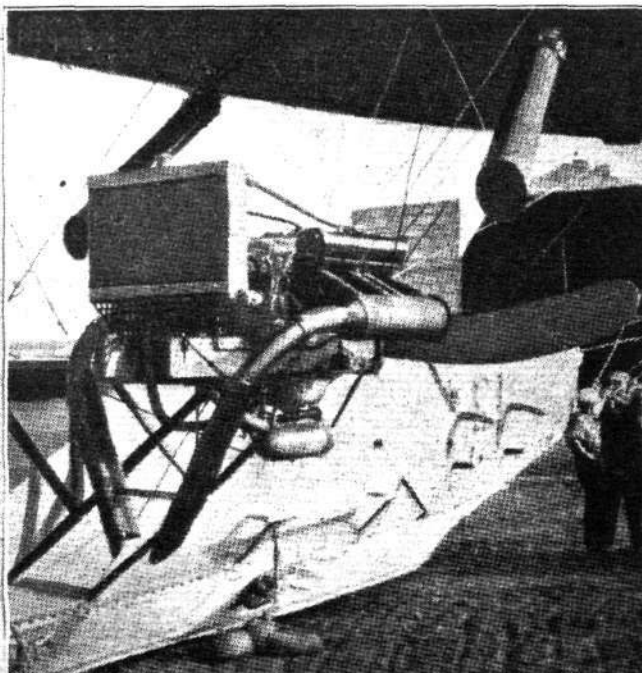
One of the most difficult materials required was the alu-



The U.S. Navy C-5 twin-engine dirigible, which flew from Cape May to Newfoundland during an attempt to cross the Atlantic

to make some sort of provision for their construction if we desired to keep up with the times. The task of building such tremendous structures while in the midst of an intense campaign of war preparations was too much to be undertaken at that time, so we contented ourselves with making certain

minium alloy for the structural frame, which had never been manufactured in this country. Inquiry regarding this was sent to the Aluminium Co. of America in 1916, and they



The "bows" of the C-type car, and on the right the port engine of a C-type dirigible

undertook, in co-operation with the Bureau of Standards, to produce such material. They were given samples of German Zeppelin wreckage obtained abroad. This was analysed, duplicated as to chemical composition, but did not develop the desired strength until a correct heat treatment was finally hit upon. Experimental girders were made up for test to get design data and to develop the manufacturing processes in manipulating the alloy. I am very happy to say that, after two years of work, an American alloy has now been produced which appears to be satisfactory in every way and to exceed slightly in strength and elongation the original German samples.

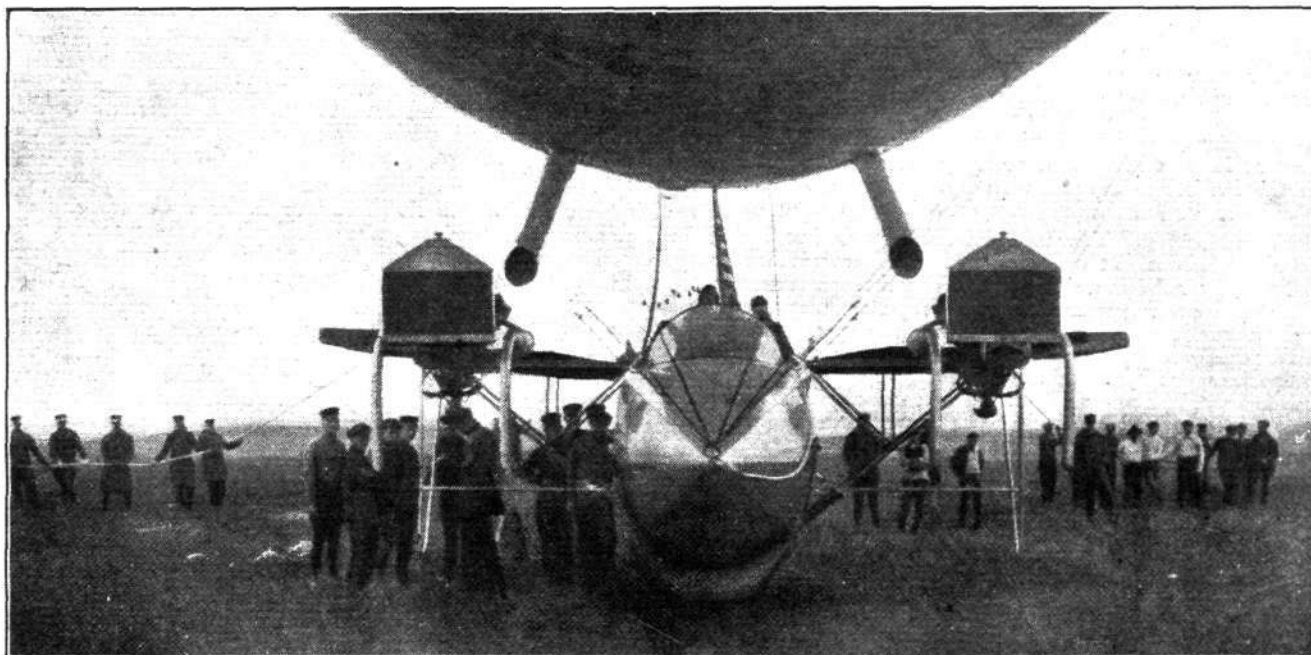
This is an alloy of aluminium containing about 4.5 per cent. copper with smaller amounts of manganese, magnesium and silicon. In the soft condition as it comes from the heat treating bath the tensile strength is about 40,000 lbs., but in 24 hours it seasons and hardens to 60,000 lbs. tensile (15 per cent. elongation). It therefore duplicates mild steel in strength, but weighs less than half as much. In the soft condition it may be bent, stamped and worked cold into useful shapes, and will harden afterward without subsequent warping or heat treatment.

We knew that the German gas cells were made of a cotton fabric covered with goldbeaters' skin, which was of a high degree of resistance to the passage of gas, but we had no knowledge of the processes by which this delicate membrane

This necessitates changes in oiling and different jets for the carburettor. The airship engine should resemble the automobile engine more than the aeroplane engine. It normally runs at from one-third to one-half full power; only in the case of a strong head wind is full power called for. The aeroplane engine always runs full power at the start and when climbing, and not below three-fourths power the rest of the time. Ten or twelve hours is a good run for heavier-than-air craft, but in an airship we have already cruised for 40 hours with one of our little ships, and the British record is over 100 hours. The Union Gas Engine Co., of Oakland, Calif., has attacked the problem of producing an airship engine, and their six-cylinder engine will be the standard equipment for all airships of the C and D classes. It has shown great reliability and very low fuel consumption over a wide range of powers.

The Liberty engine is apparently one of the most versatile of creatures. Lacking a large engine similar to the Maybach, we turned to it as a possible airship engine, and found that at from 250 to 300 h.p., the power of the Maybach, the Liberty was at least as economical, no heavier, and apparently as thoroughly reliable and capable of operating for indefinite periods.

One of the greatest problems in connection with the rigid airship is that of maintaining the ship at a constant elevation as the fuel is burned out. Ordinarily this means that, as



Front view of the car of the C-type twin-engine dirigible

was attached to the fabric or kept in proper condition. Experiments were begun at an early date, and are continuing up to this time, on various methods of attaching goldbeaters' skin to the cloth, and we now have two successful methods, each presenting advantages over the other and each resulting in a fabric of high quality. One method uses the skins green as they come from the pickle, and the other requires preparation into a sheet, which is then fixed to the cloth by a cement much in the same fashion as rubberised fabric is plied together.

Fabric showing diffusion as low as 0.2 litre per square metre has been produced weighing only 5 oz. per square yard. (The notation appears mixed, but is that of the chemist in the first case and of the textile trade in the second.)

There has been a continuous endeavour both here and abroad to produce some sort of an oil or compound which might be applied to cloth and which would give the same resistance to the passage of hydrogen as goldbeaters' skin. So far nothing has been discovered equal to goldbeaters' skin—that is, nothing of similar weight. Our experiments, however, have resulted in the development by Lieut. H. A. Gardner, of the Bureau, of tung oil coatings, which approximate the resistance to permeability of goldbeaters' skin very closely. When varnished they equal the true skin, and are only slightly heavier.

Special engines for airships have not been developed in the United States to any extent, and we have been using aeroplane engines running at reduced power to get reliability.

the ship grows light, gas must be valved, and the possibility of rising to greater heights in the future is consequently reduced. There have been many projects put forward for the prevention of this, including the taking up of water from the sea and the condensation of the moisture in the exhaust gases. Theoretically it should be possible to recover from the exhaust gases of the engine one and a-quarter times the weight of the gasoline burned, but so far no one has ever succeeded in doing this with an apparatus which is practicable for use on an airship. The Bureau of Steam Engineering has, however, been conducting experiments, and has developed an apparatus which has succeeded in condensing as high as 99 per cent. of the weight of fuel burned and has kept the weight within practicable limits. When it is considered that the best previous record for a similar apparatus which could be carried in the air was about 55 per cent., it is believed that a notable improvement in airship operation is due.

In discussing lighter-than-air progress, I should like to point out that while the airship is now being pushed by the Navy, we have had a late start. Compared with the NC flying boat, which is in advance of anything in the world, our best airships, the C class, while as good or better than any of equal size, are very small indeed compared to a Zeppelin. Consequently, we may expect progress in airship design in the United States to be more rapid in the next few years than in seaplanes.

AIRSHIPS FOR THE NAVY: SOME SUGGESTIONS FOR THEIR DEVELOPMENT

BY RAFEX

Now that the transfer of airships to the Air Ministry has been consummated by the removal of the staff from their isolation in Westminster, it is perhaps opportune to put forward various ideas for the development of airships in the future which have been maturing in the mind for the last six months or so. It is proposed to deal not with the commercial aspect, which may safely be left in the hands of the airship transport company which is gradually being evolved, so much as with the Service side—which is not a fashionable topic of the hour, but is none the less important. As a result of the sale of R 38 to America, there is grave reason for anxiety as to the provision of airships for work with the Fleet in the future. It is, perhaps, not fully realised that the Government do not propose to retain for Service purposes any of the ships now building—that is to say, R 34, which is a copy of a German design of 1916, will be, unless and until a change of policy arrives, and a new programme decided upon, our only rigid airship of even approximately modern design. R 80, R 36 and R 37 are all to be disposed of to commercial enterprise when completed. Now it is perfectly manifest that it takes at least twelve months, and a safer estimate would be eighteen months, to put into the air a rigid airship, counting from the moment that design work is commenced. Such design work is based not only on constructional experiments and experience gained during the building of previous classes, but, to an at any rate equal extent, on points arising during extended trials both in the air and on the ground after the ship is put into commission. Anyone who has had any experience with aircraft knows the defects and openings for improvement which constantly become manifest with increasing experience. The whole of this experience will be lost in the case of R 38; or, rather, will be lost to this country, but gained by America. As she is the largest rigid airship that has yet been constructed, we are, therefore, in effect, selling to America the chance of becoming pre-eminent in airship design for the sum of half-a-million pounds. Even in these days of retrenchment the price hardly seems adequate.

As it is now too late to cancel the sale of R 38, it would appear at least advisable to recommence work on R 39 (her sister ship), which should be completed and used for naval work; and to prepare for the production of a minimum of at least two rigid airships per year in order that a certain steady development in design may take place. If this is not done, and done quickly, in eighteen months' time we shall be definitely out of the race for naval rigid airship supremacy. This is not a "scare" headline of the yellow press; it is merely an only too obvious deduction from the facts. The Government attitude is, of course, that they are relying upon commercial enterprise to pull the irons out of the fire for them. But whence is that assistance coming? There is in process of gradual evolution an Airship Transport Co., based upon the analogy of the big shipping companies, such as the White Star and the Cunard. This company will not, presumably, design, but will merely operate airships designed and built by the constructional firms. The proposal appears to be that this company shall commence with one airship station—probably Pulham—at which airships purchased from the Government shall be based. These will be some or all of R 33, R 80, R 36 and R 37. One fact at any rate which is abundantly clear is that unless the capital of this company is to be of dimensions which are beyond all reasonable probability, it will be at least three or four years before it is in a position to give orders to the constructional firms for any airships specially designed for commercial purposes. Unless, therefore, orders are to come from the Government, it is difficult to see how the constructional firms are to be able to afford to keep together skilled employees for the purpose.

From all of which it follows that the Government cannot reasonably look to commercial enterprise for assistance before the end of 1924 at the earliest. In the meantime, the whole rigid airship constructional and (private) design resources of the country will in all probability have turned to other work, and we shall have been overtaken by America and France as well as Germany. It appears, in fact, as if the Government were at least four years too soon in cutting down their own programme and relying upon commercial enterprise.

The whole question of rigid airship design in this country is an exceedingly difficult one. There are only two design

staffs in the country. One is the official designers who have been at the Admiralty—detailed for the work from the Department of Naval Construction—and are now going over to the Air Ministry for a six months' trial to see how they like the new régime. The other is the airship design department of Messrs. Vickers at Barrow-in-Furness, who are responsible for R 80. Of these there is no question—whatever may be the opinion of their competence—but that the former have had immeasurably the greater experience and should possess the greater knowledge, owing to their familiarity with German practice from a study of Zeppelins, both in this country, and, since the Armistice, in Germany. It is equally unquestionable, from past experience with aeroplanes, that the organisation from which the best results are obtained is to place the responsibility for producing new designs upon the firms, while the officials concerned, in the department of the Director-General of Supply and Research, check and criticise the designs. This is, however, impossible unless the constructional firms can rely on orders from which they are to draw the necessary profits upon which to pay their design staffs. It is to be feared that the old error of the Royal Aircraft Factory may be repeated in the case of airships and a staff employed upon the preparation of official designs, while at the same time being called upon to criticise the designs of outside firms. This should not be permitted, but it is difficult to see how it can be avoided during the next four years if no Government orders for rigid airships are to be given. As soon as commercial airship services develop this difficulty will be overcome, as there will then be private orders which will make it worth the while of constructional firms to employ design staffs.

There is, or was (I believe it is not yet abandoned), a move in some official quarters which would make the present position worse. It is proposed to establish at an existing constructional station an "airship dockyard"—analogous to the "Factory" in the old days—at which the Government would themselves construct airships to their own designs. This scheme, if allowed to go through, would be not only an unjustifiable charge on public funds, but would further reduce the prospective work for the design staffs of commercial firms; while tending to perpetuate the evil, pointed out above, which was only eradicated after several years and much agitation in the case of aeroplanes.

Up to the present one has been confining one's remarks to airships of the rigid type, but the position is much the same with regard to non-rigids; with the proviso that it is, if anything, slightly worse. During the last year there has not been a single non-rigid airship designed since the Armistice produced from any source; whilst, since the early days of 1915 no non-rigid airship has been commenced in this country to other than official designs. In other words, the practical knowledge of the results of design and experience in rigging is entirely in Service hands; while even official design has been completely stagnant for twelve months. This somewhat lengthy preamble has been necessary in order to clear the ground for certain suggestions which it is hoped will be found of a constructive nature. In the first place, it is desirable to provide any firm interested in the design and construction of airships with the fullest possible information from official sources of the experience gained during the last five years in the design of airships—rigid and non-rigid. Secondly—unless it be decided that airships will not be needed in future naval operations—a definite programme, however small, of airships for Service purposes should be laid down by the Government in order that the gap may be bridged until commercial airship services develop. Full specifications should be issued, designs invited, and tenders subsequently asked for. In this way the firms will be assured of a certain number of orders, while the Service will have progressively improved airships with which to train and experiment. What is perhaps an even more important matter is the organisation of Service experimental work. Up to the present, owing to the airship staff being isolated at the Admiralty, there has been no possibility of co-operation and conjoint working with the aeroplane experimental staff. If the proposed "airship dockyard" scheme comes to fruition, or if the airship experimental work is centred at Howden, this state of affairs will be perpetuated and one of the chief advantages of the transfer to the Air Ministry lost. To avoid

this I suggest that all "constructional" experiments—i.e., those on girders, fabric, hydrogen, etc.—as opposed to flying experiments, should be carried out at the Royal Aircraft Establishment. This would be economical in abolishing duplication of staff and machinery, while having the inestimable benefit of ensuring that airship and aeroplane experiments, the results of which are in many cases interchangeable, proceed side by side under the same roof. There would be no need for the erection of airship sheds at Farnborough, as it is not proposed to carry out flying experiments there. In fact, it is doubtful whether it would mean any increase at all, except possibly for a very small number of special instruments for testing purposes, in the existing resources. Presumably the existing practice would then be followed, in the case of non-rigid airships, of putting out the various parts to firms for construction. Until some commercial enterprise develops, it would probably continue to be necessary for these parts to be delivered to the Service—presumably now at Howden,

since that is the only station to be retained—who would rig the ship and put her through the necessary tests.

In this way a continuity of improving types—if not an adequate fleet—of airships would be ensured to the Navy until the time arrives when commercial enterprise will supply a nucleus which could be converted to war purposes in emergency. Otherwise we shall cease to progress, and merely stagnate in the condition of development which we had reached in November, 1918, with the training and experimental airships gradually becoming fewer and fewer as they disintegrate through old age. In the meantime we have a steady flow of necessary constructional experiments proceeding at the minimum cost and with the maximum of efficiency owing to advantage being taken of the enormous experience gained with aeroplanes during the War. It is frequently too little realised how many points the airship and the aeroplane have in common, emphasis usually being laid upon their dissimilarities.

HIGH ART IN

OWING to the difficulty of obtaining the use of a suitable gallery this year, the 64th Annual Exhibition of the Royal Photographic Society of Great Britain has found its home at 35, Russell Square, W.C., where the series of fascinating photographic studies will be on view until November 29. Considering the charge for entrance—viz., free to all—we fail to see where the profit comes in, let alone profiteering. Even if a reasonable charge for admission were made, it should receive goodly patronage in acknowledgment of the efforts of the Society to maintain the high standard of art which is evident in so many of the works seen on the walls. All tastes are catered for from the more popular pictorial subjects to the highest technical photographic results. From abroad, in little known countries, are some remarkable records of South Pacific natives in all their natural surroundings.

In one from German (pre-War) New Guinea of the "Duk-Duk" man, what appears to be a huge grotesque head-gear of kinds is the attraction. It is to be hoped some observant milliner does not blow into the show and obtain inspiration from this unique study. The police would certainly have to interfere at its advent at any matinée.

The rooms devoted to pictorial photography contain most of the pictures on show, and in the main room are to be found many Rembrandt effects which are reposeful and almost reach the pitch of the most cherished traditions of the brush artist. So delicate are some that they surpass even the most cleverly executed etchings, and with the artists' signatures attached convey a merit far beyond the intrinsic value placed upon them in the catalogue. The nude is well represented, and is surpassed only by some of the studies of diaphanously draped figures. Portraiture finds original and varied expression, whilst in No. 12, a portrait study of the "Little Wizard," a sepia platinotype by Miss Olive Edis, is found the Prime Minister to the life. Mr. Lionel Wood is well represented on the walls, and we wish we could say that his "Aeroplane Banking" were up to the quality of the other work of this artist. Coloured photographs also afford a diversion.

A set of colour transparencies stand as examples of what perfection can be obtained in reproducing nature in its colours by this process. Each plate is a study in itself, and brilliancy is ingeniously obtained by reflection through the negative, set at an angle, on to mirrors.

Cricklewood to be H.P. Station

As soon as Customs Offices have been erected, the Cricklewood Aerodrome will be the departure and arrival centre for the Handley Page aeroplanes carrying out the air services between London, Paris and Brussels.

No Flying from Weston Sands

For the moment the golfers have prevailed at Weston-super-Mare, and the Council have decided not to allow flying from the sands next season. When the matter was first considered by the Sands Committee, protests against the granting of the concession were made by the golf club and the residents of South Ward. The main point made was that spectators had trampled down the bents and so caused a sanddrift, the removal of which would be an expense to the golf club, while mention was also made of the nerve-strain suffered by certain residents through aeroplanes flying over their houses. The Sands Committee decided to recommend that there should be no more flying from the sands. When the matter came before the Council, there was some opposi-

PHOTOGRAPHY

What particularly interests students of aviation is found in the room devoted to technical subjects. No. 231 is a radiometalogram of the cylinder of a Le Rhone engine, taken in four sections and pieced together to show entire cylinder, by Hector Pilon and Geoffrey Pearce.

Next to this is No. 232 showing the examination of aircraft materials by X-rays. There are six plates by Maj. G. W. C. Kaye and Dr. Robert Knox, F.R.P.S.

No. 1 shows front and side views of a wooden aeroplane-spar built up of three laminæ glued together. The centre layer is seen to contain forbidden knots and worm holes, and the spar was rejected.

2. Radiograph of high-tension wireless cable for a sea-plane. The insulation is of rubber. On external examination defects were suspected. The nature of these defects is clearly disclosed by the radiograph.

3. Radiograph of wing skid, showing that the strut had been cut off too short and that a false packing-piece "B" had been inserted at the bottom of the aluminium socket.

4. Front and side view of end of box strut, built up largely of plywood. The radiograph reveals defective workmanship, the wooden end-block being misshaped and split by screws.

5. Front and side view of a spliced joint in an aeroplane spar. The joint could not be seen owing to its being completely covered by glued linen-wrapping. The radiograph revealed the type of joint to be one not authorised, and the spar was accordingly rejected.

The radiograph incidentally shows the difference in opacity of the aluminium washer and the steel wire-holding plate. The difference between the light spring and dense summer growths of the wood (annual rings) is also clearly brought out.

6. Radiograph through a plank of silver spruce. On splitting the plank to discover the cause of the light and dark patches, extensive beetle borings were found. The dark dots proved to be the beetles themselves.

There is also a series of cloud studies taken at two different levels, the work of Mr. G. Auborne Clarke. In the study of meteorology these indicate a valuable field for research. The exhibition, which is open from 11 a.m. till 9 p.m., is, we repeat, free to all, and its interest should not be judged by the absence of admission fee.

tion, but ultimately it was decided to accept the recommendation. It will therefore be necessary for aircraft companies, wishing to fly at Weston next year to acquire an inland aerodrome. During the past season more than 3,000 passengers were carried in Avro machines.

An Aerodrome for Sheffield?

A DETERMINED effort is being made in Sheffield to secure the Coal Aston aerodrome as a permanent aviation centre, and the Corporation, at the request of the Air Ministry, is to consider the possibility of taking over the ground as a municipal undertaking. A conference of Sheffield manufacturers is to be called also to discuss the question of organising regular air services to and from Sheffield.

Popular R.N.A.S. Reunion

THE reunion held on November 8 of R.N.V.R. and R.N.A.S. men who passed through the Crystal Palace Depot during the War, was so successful that it has been decided to make the reunion an annual event, to take place on the nearest Saturday to Armistice Day each year.

CIVIL AVIATION

THE following synopsis of progress of work in the Department of Civil Aviation from May 1, 1919, to October 31, 1919, has been issued by the Air Ministry:—

I.—Introduction

Except for a brief period during Easter week this year, civil flying did not open officially until May 1, 1919, and the six months which have since elapsed forms perhaps a convenient period on which to make a preliminary review of the work done by, and to estimate the future of, the Department of Civil Aviation.

Between February 12—on which date it was announced in the House of Commons that the Government had decided to set up a Department of Civil Aviation—and May 1, the official date of the opening of civil flying, a small staff began to attack the multiplicity of problems and difficulties attending the transition period from War to peace, which had to be met in the commencement of civil aviation. There were the adjustment and redistribution of activities between the service and civil sides; the framing, with the assistance of representatives from the industry and other experts, of the Air Navigation Regulations for the control of civil flying at home, as distinct from the International Air Convention, governing the regulations for international flying; the necessity for deciding upon which routes traffic was most likely to follow and develop, and the aerodromes which should therefore, be retained in the general after-War liquidation.

There were also a number of other problems of a kindred nature to assist in the solution of which there were no landmarks, no established precedents and no accumulated experience.

II.—Progress

(a) *Relations with Foreign Countries.*—The International Air Convention, which was in the main based on the Air Navigation Regulations drawn up for the control of civil flying at home, was signed on October 14 by 11 out of the 13 nations, which were parties to it, the United States and Japan not yet being in a position to sign.

The terms of this Convention were made public some months ago, but it was considered desirable to anticipate its becoming operative by provisionally opening traffic by air with certain foreign countries, as it was thought that aerial transport firms could not too soon gain experience of running regular international services, both for the benefit of the industry, and the early development of the air routes of the Empire on a commercial scale.

Great pains were therefore taken to make temporary agreements with other countries, and such were concluded with Belgium, France, Holland, Italy, and Portugal, while permission for individual flights was obtained from Denmark, Norway, Spain and Switzerland; and steps have since been taken which it is hoped will ensure the subscription of Holland, Spain and Switzerland to the International Convention at no distant date, and later of the Scandinavian countries, so that one code of rules for the air will obtain throughout the whole of Europe.

The conclusion of these provisional agreements has enabled British aircraft belonging to commercial firms to visit Amsterdam, Brussels, Christiania, Copenhagen, Lausanne, Madrid, Paris and Stockholm, whilst a demonstration flight for civil purposes carried out by R.A.F. aircraft was made as far as Helsingfors.

Every effort has been made to assist British firms to establish regular services between London and Paris, London and Brussels, and London and Amsterdam.

(b) *Reconnaissance.*—Considerable progress has been made with the reconnaissance and development of imperial air routes.

The Cairo-Karachi route has been opened for military purposes, and will be available for civil traffic at an early date. That from Cairo to the Cape has been surveyed, and a chain of landing-places established. Of the latter the section lying in the Union of South Africa should shortly be available for the use of civil enterprise, and the whole route should be capable of being flown on an experimental basis before the end of the year. A full reconnaissance of the route from India to Australia has also been completed.

(c) *Air Navigation Regulations.*—The Air Navigation Regulations which came into force on May 1, 1919, were based on War experience and on an estimate of the requirements of civil aviation. In a few directions experience has shown that there are omissions, while in others the Regulations have been found to be somewhat in advance of requirements and their strict enforcement up to the present has proved undesirable. It has not always been easy to administer

the Regulations so as to secure the safety of the public without handicapping the expansion of air work, but frequent consultations between the Department and representatives of the industry and the goodwill of all concerned have enabled a very fair measure of success to be obtained in this respect. Any defects in the Regulations or in the method of administering them brought to light by experience are corrected as rapidly as possible.

An Air Navigation Bill, to make operative the International Air Convention recently signed in Paris in accordance with its requirements, is being drawn up under which the Regulations revised to date will be re-issued.

The following approximate figures, which have been supplied voluntarily by certain of the firms engaged in civil air traffic, are interesting as showing the extent of the work carried out, and for the mileage covered, the number of accidents must be regarded as remarkably small.

| | | | | |
|---------------------------|----|----|----|---------|
| Number of hours flown | .. | .. | .. | 4,000 |
| Number of flights | .. | .. | .. | 21,000 |
| Number of passengers | .. | .. | .. | 52,000 |
| Approximate mileage | .. | .. | .. | 303,000 |
| Total number of accidents | .. | .. | .. | 13 |
| Number of fatal accidents | .. | .. | .. | 2 |

| | Total | Per 1,000 | Per 1,000 |
|--------------------|----------|-----------|--------------|
| | Numbers. | Flights. | hours flown. |
| Pilots killed | 2 | ·095 | ·5 |
| Pilots injured | 6 | ·286 | 1·5 |
| Passengers killed | Nil | Nil | Nil |
| Passengers injured | 10 | ·476 | 2·5 |

Percentage of passengers injured to those carried, '019, in other words, for every 5,200 passengers carried only one has been injured.

It will be noted that the great majority of the flights were of short duration.

Indeed, much of the work during the period under review may be said to have been of an educative character. At the same time, since the greater number of accidents occur in getting off and landing, the proportion of accidents to flights made is a truer guide than that for hours flown. The figures clearly establish the fact that firms are intent on securing the safety of the public and also that the regulations in force are in principle suitably designed to attain that object.

(d) *Accidents.*—Stress has been laid on the necessity for the punctual report and investigation of accidents, as only by this means can the weak points in administration, personnel and material be eliminated and the safety of the public proportionately increased. The organisation for this work built up during the War by the R.A.F. has been absorbed by the Civil Aviation Department. On receipt of the report of an accident involving a fatality, or injury to personnel, or serious damage to a machine, experts are immediately sent to investigate matters on the spot. This work has fortunately been exceedingly light and the facilities afforded by the firms concerned have enabled the necessary investigations to be carried out satisfactorily.

(e) *Aerodromes and Licensing.*—In the same way as ships require harbours, so aeroplanes and seaplanes require aerodromes, which have to be built, inspected and licensed. Licences also are necessary for the pilots competent to control the machines, and for the officials at the aerodromes qualified to pass machines as fit for flying, while every civil machine has to be registered and numbered in the same way as a motor car, and, if flying for hire, must in addition be certified as "airworthy." A special branch of the Department of Civil Aviation deals with this and kindred questions, and between May 1 and October 31 has granted the following licences and certificates:—

| | | | |
|-------------------------------|----|----|-----|
| Licences for pilots | .. | .. | 374 |
| Licences for ground engineers | .. | .. | 258 |
| Licences for engineers | .. | .. | 1 |
| Licences for navigators | .. | .. | 2 |
| Licences of aerodromes | .. | .. | 92 |
| Certificates of registration | .. | .. | 303 |
| Certificates of airworthiness | .. | .. | 241 |

The reason that there has as yet been little or no demand for engineers' or navigators' licences is that conditions which would necessitate the inclusion of these classes in the crew of an aircraft are not yet common.

The large majority of the aerodromes licensed have been those in the vicinity of towns required temporarily by firms engaged in carrying passengers for short flights.

It is believed that the London terminal customs aerodrome at Hounslow is the only one of its kind in Europe, and that

the organisation for dealing with regular traffic arriving by air from other countries has not elsewhere been so fully developed. Lympne for aeroplanes and Felixstowe for seaplanes have also been constituted as customs aerodromes.

During the six months under review an approximate sum of £2,000 has been received at Hounslow, in payment of housing and accommodation fees, etc., apart from the sale of petrol and oil. From this fact it is fair to assume that a definite revenue will be derived from the main aerodromes of the future.

In addition to the licensing of aerodromes already carried out, negotiations are in progress for the establishment of land or sea aerodromes under the control of the municipal authorities, to serve the undermentioned localities:—Edinburgh, Newcastle, Southport, Liverpool, Leeds, Bradford, Hull, Manchester, Margate, Southampton.

For emergency landing grounds a large number of possible sites have been notified by Lords Lieutenant. The inspection of these sites, however, must, of necessity, cover a considerable period, and some time must elapse before maps showing the emergency landing grounds available in each country can be completed.

(f) *Communications*.—One of the lessons learnt during the War was the supreme necessity for rapid ground communication. It was early realised that for civil aviation ground communications, wireless, etc., must be speeded up, and greater facilities afforded, in order that the arrival and departure of machines should be promptly reported. For this purpose the ordinary public telegraph and telephone service is often insufficient. Owing to the time occupied in conveying the message to and from the nearest public office, and the pressure of traffic at the present time on the long-distance telephone lines, especially abroad, the aeroplane may arrive as soon as, or even before, the receipt of the message announcing its departure. The scope of the branch at the Air Ministry in charge of this particular work covers the requirements of both civil and the service sides. For the present purpose, however, it is proposed, as far as is possible, to refer only to its functions in regard to civil aviation.

The duties of the Communications Branch may be regarded as falling under two broad heads, which, for the sake of convenience, may be termed *signals* and *navigation*.

Signals.—Under the first heading an important part of the work carried out has been in connection with wireless telegraphy and telephony, and the development of aerial navigation by means of directional wireless. Wireless stations have been erected at Hounslow and Lympne, and wireless liaison has been established with the French for the purpose of the London-Paris air route. By this means machine reports and weather reports have been successfully exchanged, the number of such messages on this route averaging 30 a day. From the experience thus gained it has been possible to inaugurate similar arrangements, which are now nearly complete, for the Belgian and Dutch routes.

Meteorological reports will in future be transmitted almost entirely by wireless telegraphy. At present weather reports are received by this means from British and Continental stations for the information of the Meteorological Service, and weather forecasts distributed three times a day from the Air Ministry.

A complete scheme of wireless organisations for the entire Meteorological Service has now been prepared. In addition to communications, the branch is responsible for the supervision of the training and examination of the wireless personnel.

Regulations are also being drawn up in conjunction with the Post Office for a revised wireless operator's certificate in order to provide for qualified "air" wireless operators. Similarly, the conditions for obtaining licences to work wireless stations have been revised to include the use of wireless in commercial aircraft and from ground to air.

It may be noted that the Communications Branch has, since the Armistice, been instrumental in arranging for the release for public use of switchboards, 63; trunk lines, 96; exchange lines, 324; telephones, 2,040.

Navigation.—On the navigational side, the whole of the London to Paris air route has been surveyed, an experimental strip map prepared for aerial purposes, and "flying directions" compiled containing information as to aerodromes, landing grounds, wireless and meteorological data. This is the first of a comprehensive library of air maps and flying directions which it is hoped will be produced for all the main routes. Charts and maps are also prepared and issued for all intended flights on new routes.

In co-operation with Trinity House, proposals have been considered for the installation of an aerial lighthouse system on the London to Paris route, and an experimental lighthouse has been erected at Hounslow. Preparations have also been

made for the lighting of the aerodromes on this route, in the event of firms setting up services which necessitate night flying.

(g) *Collation of Information*.—Technical information is collected and collated by the Information Branch from the various foreign journals with a view to assisting the constructive side of the industry, civil and service. From time to time, as thought necessary, technical memoranda on different subjects are issued. The Research Branch of the Air Ministry is kept supplied with information, as also is the business community interested in civil aviation.

In regard to foreign markets, close co-operation has been established with the activities of the Department of Overseas Trade and the various naval and military attachés. By these means British firms are supplied with information in the form of periodical summaries on such matters as foreign aviation, amalgamation of foreign aircraft firms, regulations and by-laws affecting civil aviation in foreign countries. During the past two months 45 special notices have been sent out through the Society of British Aircraft Constructors, and numerous requests from British firms for information on urgent questions have been received and answered.

This Branch is also responsible for the issue of official Press *communiqués* on all questions affecting civil aviation.

(h) *Meteorology*.—To no other form of human activity are the vagaries of the weather so vital as to aviation. Information of air currents, and more especially of mists and fog, may make the difference between success and failure. For this reason, and although the claims upon a Government meteorological organisation of the Army, the Navy, the Board of Agriculture and Fisheries and other bodies concerned were fully recognised, it was recently decided by the Cabinet to transfer the Meteorological Office and attach it to the Civil Aviation Department of the Air Ministry. With the exception of one or two details, the arrangements for this transfer are now complete.

As much as possible of the personnel, etc., are being moved from South Kensington to Kingsway; but lack of accommodation makes a complete transfer at present impracticable. A new Meteorological Committee has been formed, with the Controller-General of Civil Aviation as President and Sir Napier Shaw, Director of the Meteorological Office, as Chairman. On this Committee the Royal Society has two representatives, and the Admiralty, War Office, the Board of Agriculture and Fisheries, the Board of Trade and Colonial Office, have each nominated one representative.

Endeavours are being made further to assist scientific research, and, in addition to the ordinary routine work of the Meteorological Office, special attention is now being devoted to the requirements peculiar to flying.

A system of weather maps is being produced at six-hour intervals from information supplied by a network of R.A.F. and Civil Meteorological Office stations, and reports and forecasts covering various aerial routes have been prepared and issued, together with maps showing the speed and direction of the upper wind over each.

In connection with the Cape-Cairo route a statement has been drawn up showing the annual variations of the weather by months.

Special attention has been given to the London-Paris route, for which the service of weather reports is being improved. Good communications are vital to an efficient meteorological service, and in this particular some difficulty is necessarily experienced in dealing with the large area and many foreign countries now concerned. All countries signatory to the Air Convention undertake to carry out certain arrangements with regard to communications; but the speed in setting up a thorough system must necessarily be that of the slowest country.

One of the first steps consequent upon the transfer of the Meteorological Office to the Air Ministry has been the closing down and elimination of many R.A.F. meteorological units called into existence during the war. General after-war requirements for meteorological information have been considered, and a scheme formulated providing for the least possible number of stations necessary. The policy followed has been to obviate overlapping between flying and non-flying meteorology.

The personnel of all meteorological stations at home is being placed on a civilian footing. Where service personnel is employed, as, for instance, in Egypt, it will be trained by the Meteorological Services. The necessary steps for the demobilisation of service personnel and their substitution by civilians have been taken.

(i) *Airships*.—Although the rigid airship has not been exploited in this country to the same extent as the aeroplane, the commercial possibilities of this type of aircraft in con-

nection with long-distance flights are fully realised. By the curtailment of the Government airship programme a certain number of airships, in various stages of construction, became available for civil enterprise. A public meeting was held to explain the position, and those interested were invited to consider the formation of a company with a view to taking over these surplus airships and to investigate the commercial value of this type of aircraft. The formation of this company is now under consideration.

(j) *Staff*.—The staff of the Department of Civil Aviation on October 31 consisted of a total of 143, of which 52 are administrative officials and 91 clerical subordinates, at a total salary of £50,000 per annum. These figures include the Air Ministry Meteorological staff, but not the personnel of the Meteorological Office recently transferred to the Air Ministry.

It should be borne in mind that the staff of the Communication, Accidents and Meteorological branches are engaged on technical work for both the civil and service sides.

The selection of a staff to deal with the many questions involved has not been an easy task owing to the fact that the Department must in the nature of things be a civil one, and that those officers possessing the requisite administrative and technical experience can usually be found only among those who have served in or with the Royal Air Force. It has been impossible until conditions are more certain to offer fixity of tenure in the Department of Civil Aviation, and the terms of appointment have been necessarily brought into unfavourable comparison with the improved rates of pay recently conceded to the Royal Air Force. The result has been that recruitment has been difficult and slow. Steps are being taken to remedy this.

III. General Considerations and Conclusions

This brief summary of the work carried out during the last six months, and the organisation of the Department of Civil Aviation, has been written as a record of work done. If it appears that a useful purpose will be served it is proposed to issue a further synopsis at the end of another period of six months. No attempt has been made to suggest the potentialities of civil aviation. The speed at which it will develop cannot be gauged even approximately, but the possibilities are undoubtedly great, and there seems no doubt that when once the postulates of reliability, safety, comfort and economy have been met, as they will be, civil aviation must play an increasingly important part in the development of civilisation.

It is in any case, perhaps, not too much to say that when civil aviation has developed it will be the main reserve of strength from which the R.A.F. will draw in times of stress. The R.A.F. of the future should be capable of rapid expansion and of the organised assimilation of large numbers of personnel and material at short notice. As the mercantile marine reinforced the Navy during the War, so should civil aviation be regarded as the potential reserve of the R.A.F. in future crises. This source of supply can only be regarded as satisfactory if civil aviation is in itself a healthy and well-developed body. The building up of such a body on a true basis is largely dependent upon the growth of a steady demand for quicker communication. Irregular and spasmodic demands keep the cost of such communications at a high figure, and do not, therefore, assist development.

The carriage of mails promises to be one of the most important and regular demands which can serve to develop civil aviation and to place aerial transport concerns on a firm footing. The future of aerial mail services lies on those routes where a material saving of time can be effected, so that a definite commercial advantage may be obtained. In England, railway communications and distances are such that letters posted at the end of the business day can be delivered early next morning at almost every large town by the regular train services. The Postmaster-General is doubtful, therefore, whether the demand for express mails during the day time between the more distant towns in the United Kingdom is likely to be sufficiently extensive to meet the considerable expense of running such a service for mails only. But if commercial services were established for passengers and goods, the opportunity would be taken to utilise them for express letters.

The line of development of aerial mails would seem to lie more on the Continental and Imperial routes, where the long distances give more scope for the element of speed.

To Replace the "Bodensee"

UNDETERRED by the mishap to the "Bodensee," the owners of that vessel have placed an order for the construction of a new passenger airship of similar type, which will be placed in service as soon as possible.

For example, in normal times the ordinary time of transit by railway is 36 hours to Turin, 48 hours to Rome, 23 hours to Berlin, 58 hours to Christiania, and 24 hours to Berne. Over such distances the potential saving by aerial transport is considerable. If such acceleration could be obtained, and regularity of service kept up, sufficient correspondence might be attracted to enable the extra fee to be fixed at a relatively small figure. When regular services to extra-European countries become practicable, the gain in time will be still more marked.

The more such services can be brought into being, the larger is the area over which the overhead charges are spread, and the lower becomes the cost of each additional service, which automatically produces an increased demand for such services on routes where high cost has hitherto negated the desire for speed.

It has been the object of the Department to ensure the safety both of the flying and non-flying public, without imposing irksome restrictions on the various firms concerned. In numerous problems on which technical advice has been required the Department of Civil Aviation has received the assistance of the directorates of research and aeronautical inspection of the Department of the Director-General of Supply and Research, which is a separate Department in the Air Ministry from that of civil aviation. Hitherto all machines employed by civil aerial transport firms have been converted war machines, and although numerous new types are on the stocks, it may be said that no true commercial machine has yet appeared. Divergencies in type and construction between service and civil aircraft will, however, rapidly appear.

Partly owing to the difficulty of determining the future composition of the R.A.F., and the consequent uncertainty of what aerodromes will be required by the Service, it has not yet been possible to settle the aerodromes to be retained by the civil side, and to complete negotiations with the municipalities and others concerned. An Advisory Committee has been discussing this and kindred problems, together with the question of imperial air routes, and their report is expected shortly.

The work of the Department must necessarily be of a pioneer character. The results of its labours—if, indeed, the foundations of the new scheme of things have been well laid—can only become visible in their entirety in years to come. Had the spade work not been done, however, it is doubtful whether this country would have been able to inaugurate and maintain the first international air services.

It may be questioned whether civil aviation in England is to be regarded as one of those industries which is unable to stand on its own feet, and is yet so essential to the national welfare that it must be kept alive at all costs.

If this question is answered in the affirmative, there appear to be three methods of assisting it:—

(1) By means of direct Government subsidies—it is in this way that France has decided to act, and 18,000,000 francs have already been earmarked for this purpose.

(2) By recognising that at the beginning the British aircraft industry cannot stand on its own feet, and that to ensure its existence, although foreign to usual British practice, some form of direct Government assistance, probably in the shape of a grant to approved aerial transport companies for mileage and weight carried, is a necessity.

(3) By following the principle usually accepted in this country, that if an industry is to survive it must stand as nearly as possible by itself, and that a policy of "doles" is unsound. In this case the assistance given would take the indirect form of the provision of certain "key" aerodromes and shed accommodation at home and on the Empire routes, and the collation and issue of information, including meteorological data, and the provision of communications.

The problem is how best to tide over the difficult transition period through which we are passing. Adhesion to the British principle of independent private enterprise will undoubtedly be right eventually, but if a limited industry is to be maintained—as it must be to meet the requirements of the Royal Air Force—it is for consideration whether it will not be necessary to adopt a combination of (2) and (3) above.

(Signed) F. H. SYKES,
Controller-General of Civil Aviation.

November 1, 1919,
Air Ministry.

A Climbing Record

FROM Rome comes a claim for a new record. It is stated that on November 13 an aeroplane, piloted by a warrant officer, at the Montecelio aerodrome, near the Italian capital, climbed 1,000 metres in 47 secs. and 5,000 metres in 11 mins.

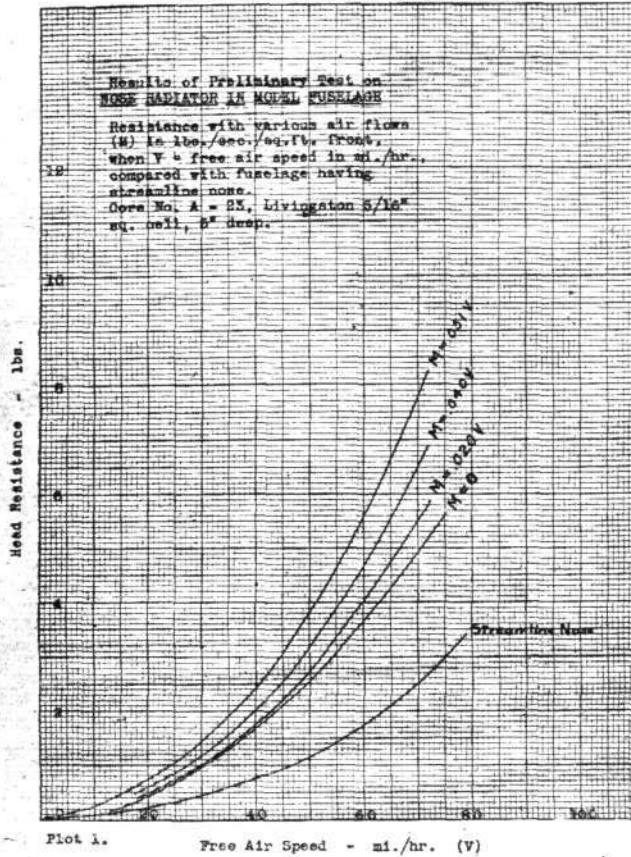
PRELIMINARY REPORT ON RESISTANCE DUE TO NOSE RADIATOR*

THE present report considers the effect of placing a radiator in the nose of a *fuselage* as compared with the

* From experiments carried out by the American Bureau of Standards, which corresponds to our National Physical Laboratory.

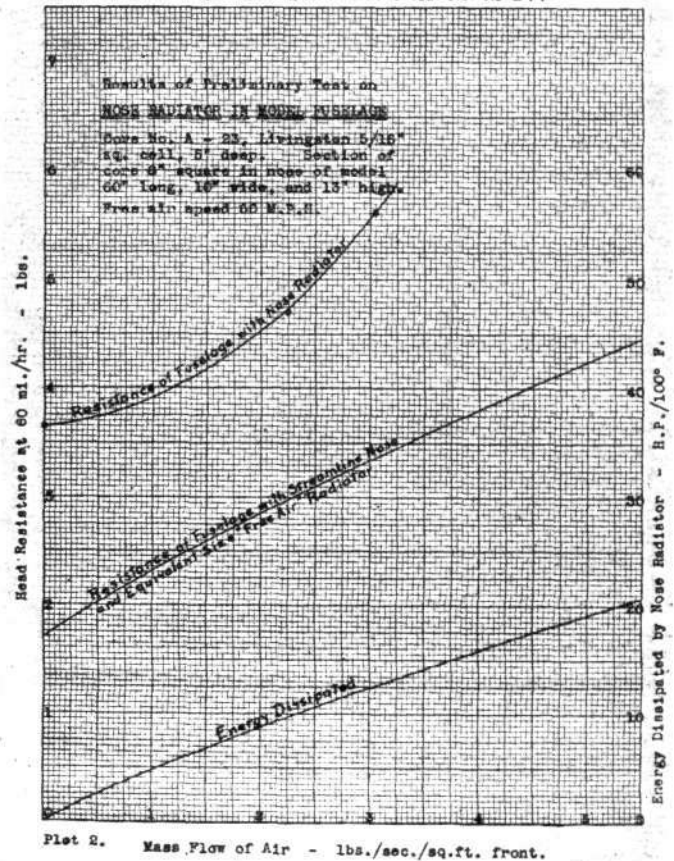
effect of placing a radiator of the same core construction, having an equivalent cooling capacity, in the free air, and streamlining the nose of the *fuselage*. The results of these tests indicate less difference than would be shown by comparing results with

BUREAU OF STANDARDS
AERONAUTIC POWER PLANTS, REPORT No. 24.



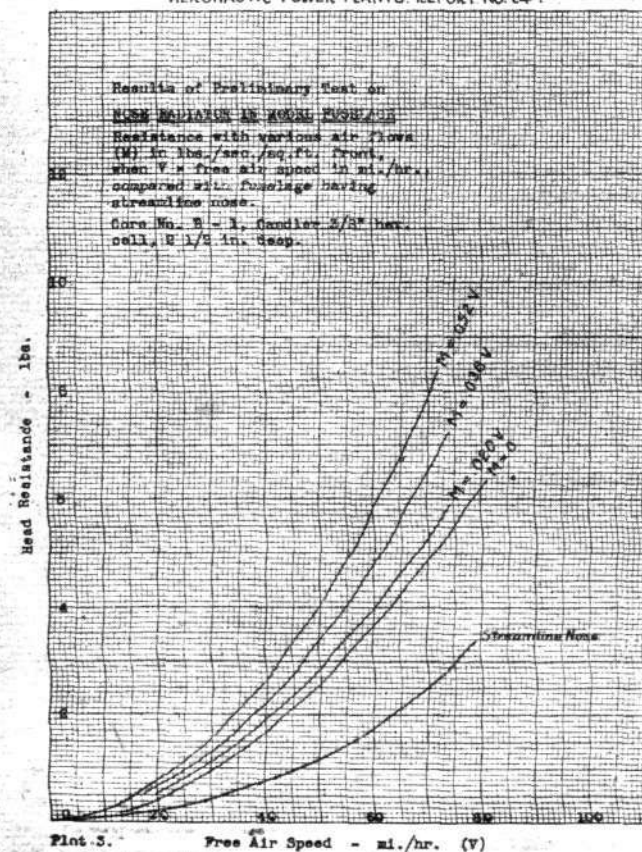
Plot 1

BUREAU OF STANDARDS
AERONAUTIC POWER PLANTS, REPORT No. 24.



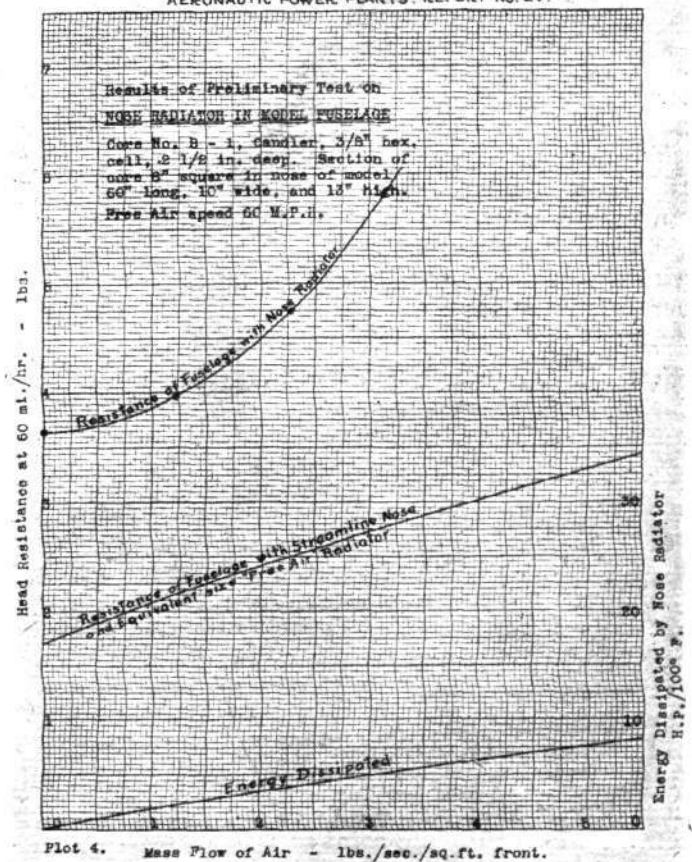
Plot 2

BUREAU OF STANDARDS
AERONAUTIC POWER PLANTS, REPORT No. 24.



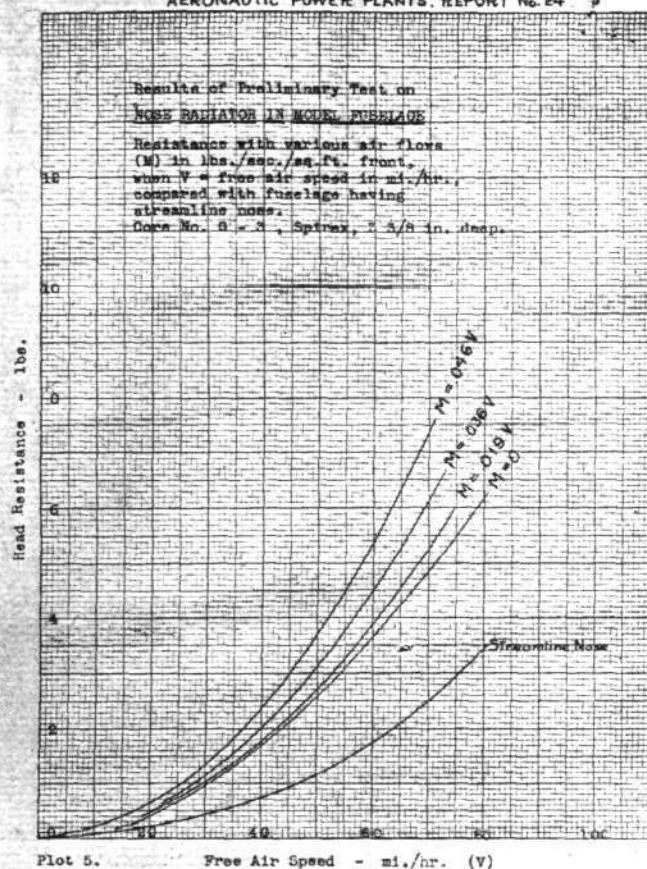
Plot 3

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AERONAUTIC POWER PLANTS, REPORT No. 24.



Plot 4

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AERONAUTIC POWER PLANTS. REPORT No. 24



Plot 5

radiators specially selected for each of the positions in which they were placed.

The results are qualitative only, but they are so striking as to indicate that the nose of the *fuselage* is not a desirable location for a radiator from the point of view of head resistance.

A model *fuselage*, 60 ins. long, 10 ins. wide and 13 ins. high, was constructed with a removable stream-line nose, which, when removed, allowed an 8-in. square section of radiator core to be placed in the nose (See Figs. 1 and 2). Two holes on each side of the *fuselage*, each about 1 1/2 by 6 1/2 ins., were cut about a foot back from the nose and fitted with adjustable sliding doors. By adjusting these vents the amount of air passing through the nose was varied.

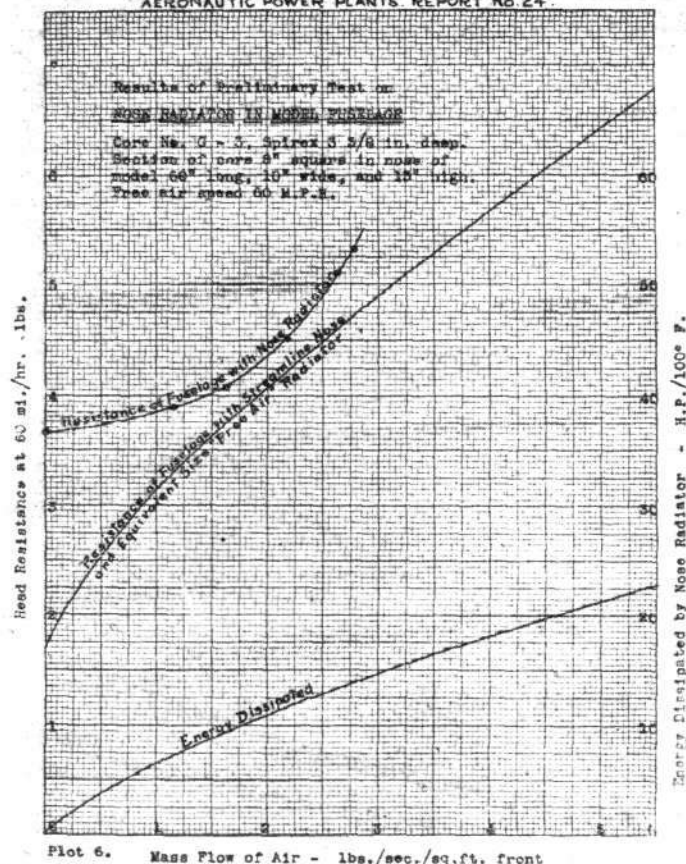
The model was mounted in a 54-in. wind-tunnel, and the head resistance measured under the following conditions:—

(1) Streamline nose on model. (No change in resistance was observed whether vents were open or closed.)

(2) Streamline nose removed, but nose radiator covered with a sheet of paper so that there was no air-flow through the core. (3), (4) and (5) Nose radiator in place, with varying amounts of air-flow controlled by opening the vents. Seven or eight different air speeds were tried in each case, the maximum being about 70 miles per hour.

The results of these runs are given in plot 1, against free air speed. They show (1) that the streamline nose decreases the resistance of the *fuselage* by 50 per cent., and (2) that the total resistance of the *fuselage* increases rapidly when air is allowed to enter the

BUREAU OF STANDARDS
AERONAUTIC POWER PLANTS. REPORT No. 24



Plot 6

radiator, so that a compact type of core is desirable for this position.

Plot 2 illustrates these conclusions more clearly, since there the resistance of the *fuselage* at 60 miles per hour free air speed is plotted against the mass flow of air through the radiator. There is also plotted the total resistance of the *fuselage* with a streamline nose together with a free air radiator of the same core construction and of such size as to have a cooling capacity equivalent to that of the nose radiator at

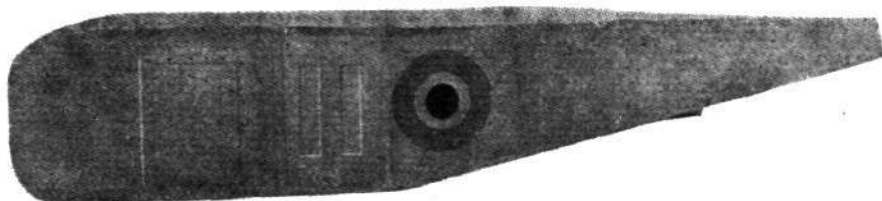


Fig. 1

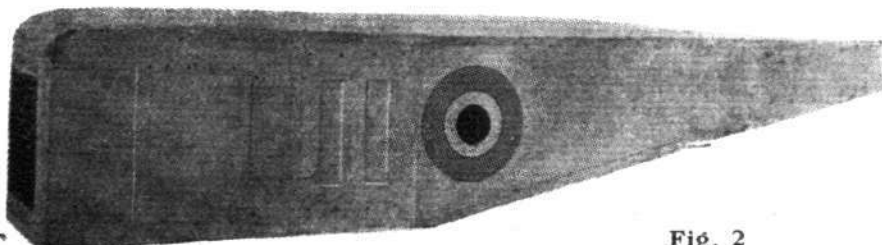


Fig. 2

any given mass flow. Plots 3, 4, 5 and 6 give the same data for two other cores, 3 and 4 being for a core of very low head resistance, and 5 and 6 for a core of very high head resistance, which would be a very good type for a nose radiator and a very bad type for free air. These are types of core considerably better for free air positions than those included in this test, while the core represented in plots 5 and 6 is probably one of the best for the nose position.

AIRISMS FROM THE FOUR WINDS

GEN. SEELY'S resignation should do good by letting the light in upon the anomalous position of the War Office and Air Ministry dual ministerial control. It is for Parliament to appreciate the vital necessities of the situation and to take a firm stand. Without delay Sir W. Joynson-Hicks, Chairman of the Parliamentary Air Committee, called the members together on Tuesday last, and it is to be hoped the open invitation to new members of Parliament and members of the House of Lords who had not an opportunity of joining the Committee, was widely responded to, in view of the important further statement made at the meeting by Gen. Seely.

WHATEVER the knowledge of the actual position may be with those who really know, the popular and erroneous view is that, in the words of so usually well-informed writer as Mr. Gerard Fiennes, the "R.A.F. is placed entirely under the War Office." It is true this may be the practical effect of the Winston Churchill duality, and for that very reason Gen. Seely has rightly seen the impossibility of perpetuating so unsatisfactory a position.

As a fair example of the very wide divergence of views held upon the maintenance of the R.A.F. as a separate entity, or its absorption by the War Office and Admiralty, a couple of communications to the Press upon the subject are well worth publicity, as showing the uninformed and narrow views on the one hand of the upholders of whiskered tradition, and the wider view under modern experience and enlightenment of the defender of a separate and independent Service. Taking the first letter, which is signed as from an "Ex-Chaplain, R.A.F.," this reads as follows:—

Gen. Seely's resignation of his post as Under-Secretary for Air raises two important questions:—First, is there the necessity for a separate Air Ministry? Secondly, is there the necessity for a separate Air Force? These two questions should not be confused. It may be necessary for the future development of aviation that the Air Ministry should retain its independence. Upon that point I do not feel qualified to give an opinion. But the necessity for the retention of the Royal Air Force on a basis of independence of War Office and Admiralty control seems to me to be very much open to question.

As a chaplain to the R.A.F. I have had considerable opportunity of estimating the efficiency of its organisation and administration. I have come to the following conclusions:—

(1) The discipline and administration of Air Force stations, being in the hands of (in the majority of instances) extremely youthful officers, who have risen to senior rank by skill and gallantry in the air during war service, could be much more efficiently and econo-

mically carried out if such stations were under purely military (as opposed to Air Force) control, and commanded by Regular military officers of senior rank.

(2) Military and naval officers, who have transferred to the R.A.F., can never work in harmony, their traditions and methods of discipline being diametrically opposed to one another. The same applies to all ranks.

(3) The training required for naval flying officers is entirely different from that required for military flying officers. A naval or military officer can be taught to fly in six months, whereas a pilot cannot be made an efficient naval or military officer in under six years.

(4) The higher control of the R.A.F. administration could easily be carried out by the War Office with but a comparatively slight increase of personnel, thus releasing a large majority of the staff at present employed at the Air Ministry. Under the existing arrangement every administrative branch is unnecessarily duplicated.

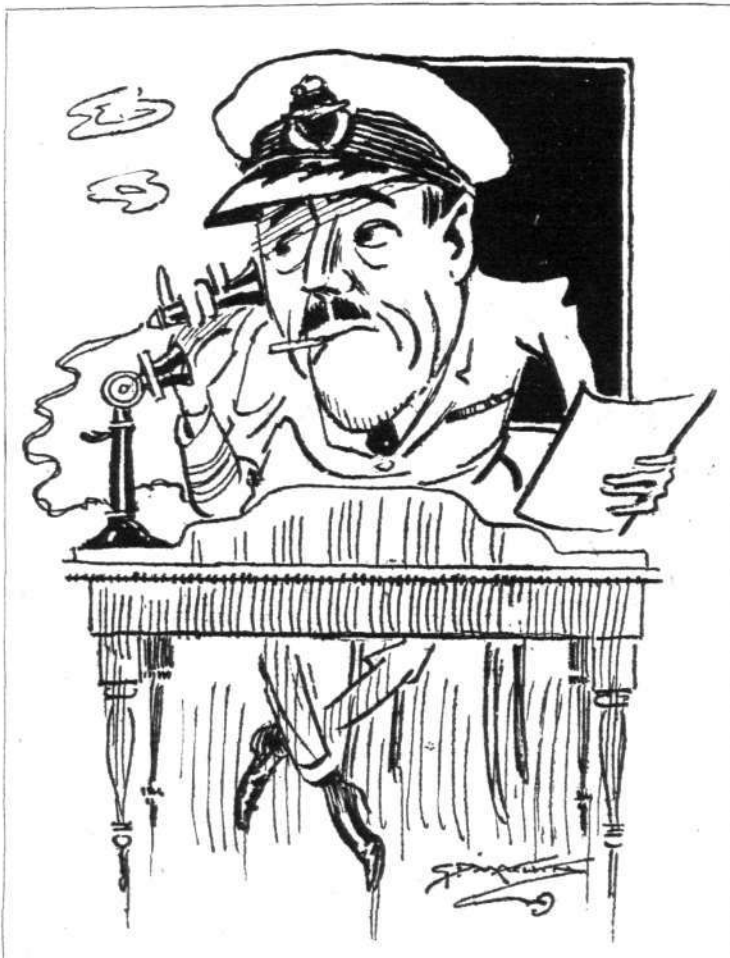
I, therefore, am strongly of the opinion that the best interests of the nation would be served if the Royal Air Force should cease to be a separate organisation, and that the naval and military branches of the Flying Service should once more be placed under control respectively of the Admiralty and the War Office.

So much for that side, about as weak a case as could well be put forward. A reply for the separate service contention comes from "Ex-Flight Leader" who answers, *seriatim*, the "arguments" of the Ex-Chaplain. Ex-Flight Leader's points are:—

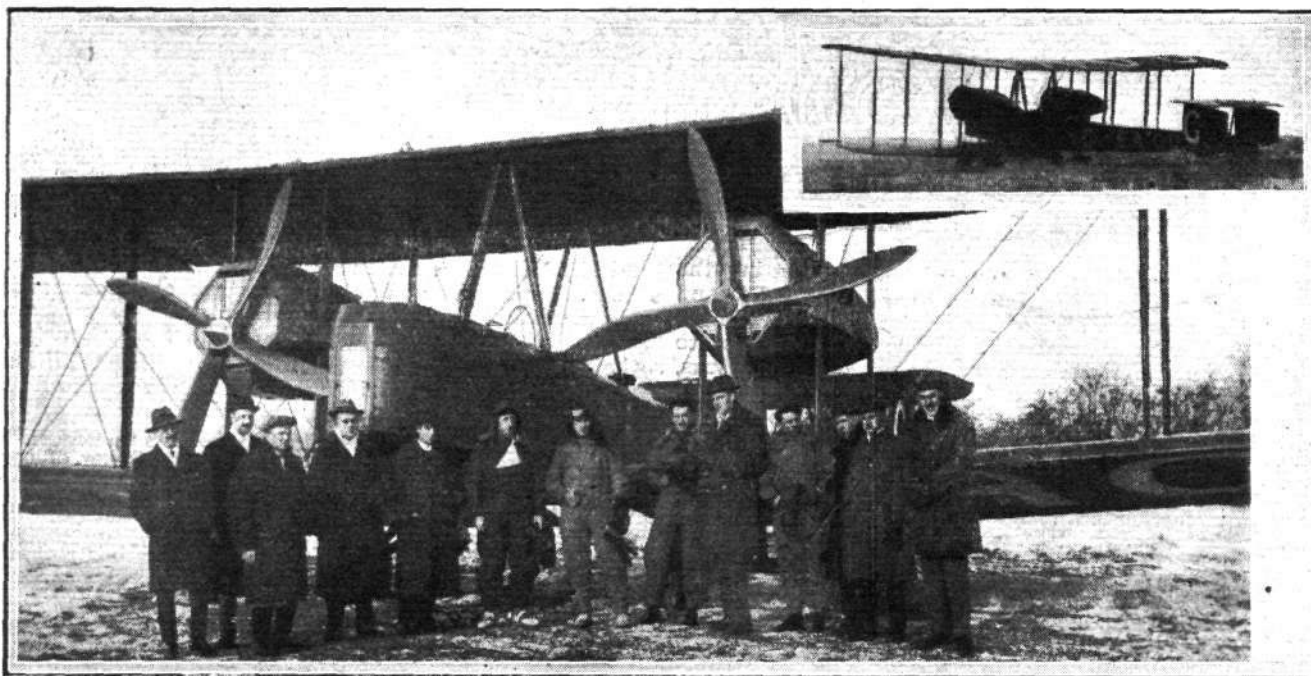
(1) "Ex-Chaplain, R.A.F." complains that the discipline and administration of the Force are largely in the hands of extremely youthful officers, and urges that the higher command should be given to Regular officers of senior rank.

We have yet to learn that the discipline and administration of the Air Services have been one whit worse than that of the Army. True, the individual flying officer is allowed to exert more initiative than his military brother. He is not so closely fettered by rusty chains of obsolete etiquette and hard-and-fast rules. Nor is it to be desired. In the career he has adopted he is never called upon to meet a situation which is exactly paralleled by a preceding one; and as a consequence has no need for manuals and regulations written in an age long since passed away. But he does require a leader; and in the very essence of things he prefers a comrade who has proved his worth in "actualities" to a relic of ancient days, dug up, may be, from a Reserve battalion or an A.M.L.O.'s office, or to an ex-Brigadier whose only excuse for appointment would be, "We must find him a job somewhere," and whose interest in aviation began and ceased the night that the Hun bombed his chateau in France.

Some R.A.F. Impressions



Squad-Leader H. E. J. Hewitt, O.C. No. XI Training Squadron, which turned out many expert flyers during the War



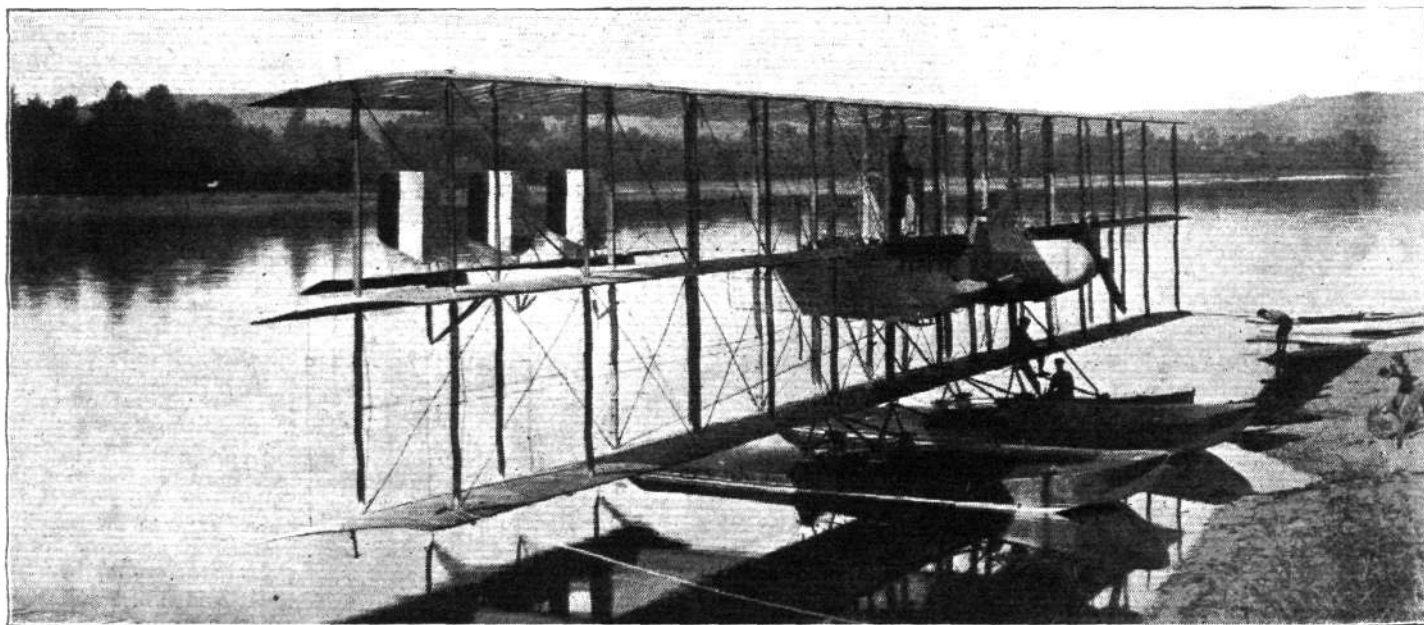
THE FLIGHT TO AUSTRALIA.—As announced in "Flight" last week, the Vickers-Vimy-Rolls left Hounslow on November 11 on its long journey. Our photograph shows the pilots, mechanics, representatives of the Royal Aero Club, and a few members of the staff of Messrs. Vickers, Ltd., standing in front of the machine. Inset: The machine starting.

(2) "Ex-Chaplain" states that *personnel* transferred from the Navy and Army to the Air Force can never work in harmony. How untrue this is can be gauged from the fact that it was only after they began to work together that the enemy lines of communication became well-nigh untenable and England became immune from aerial attack. Before April, 1918, the R.N.A.S. had enjoyed the pick of machines and engines. With the coming of the Air Force a better and juster apportionment of the good things in aviation ensued, with strikingly successful results on the *moral* and efficiency of the new arm.

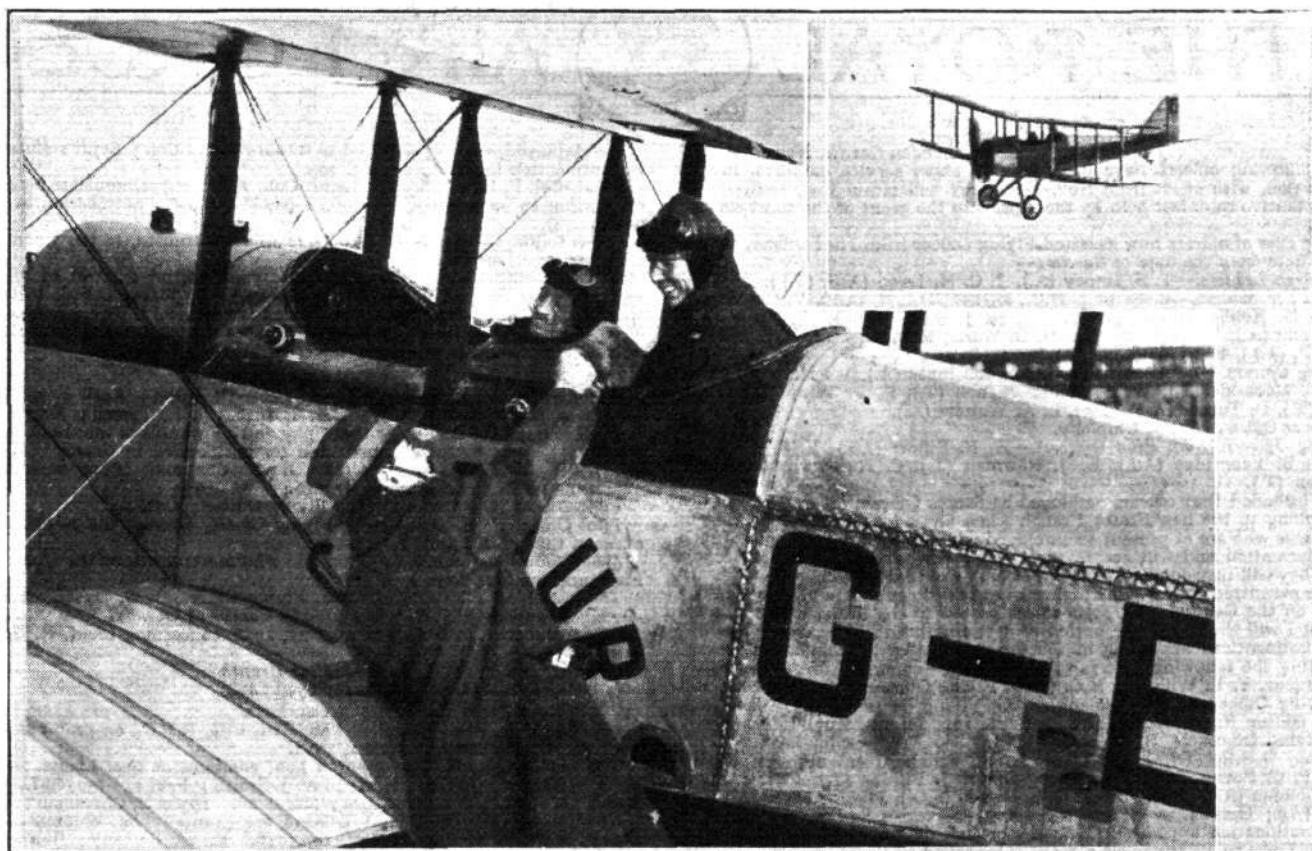
(3) The statement that a flying officer can be made in six months, but that it takes six years to convert that same officer into an efficient military or naval officer is so manifestly absurd that it requires little refutation. Suffice it to say that the writer, who has seen service both as a military and Air Force officer, has encountered numerous instances of young men who have left the Air Force for the Army and have not only served with credit, but in many cases with the utmost distinction.

(4) To say that the Air Service could easily be controlled

from the War Office shows that "Ex-Chaplain" is not writing with a full knowledge of realities. At the present moment he would indeed be a bold man who dared to affirm that the War Office is competent to handle the Army with thorough efficiency. Up to last year the War Office had control of aviation. Before the War aeronautics were regarded by the red tapeworms as an amusing and picturesque addition to manœuvres, and in 1914 were able to put some few dozen machines in the field. In the first three years of the conflict the Clammy Hand was still laid on private enterprise; and our airmen were still sent to meet the Hun in machines whose only recommendation lay in the fact that they were turned out from Government factories. With the establishment of the Royal Air Force and the consequent introduction of "live" and experienced men into controlling positions, came the short and welcome bound into aerial supremacy which in the last weeks of the War made the enemy position in the air practically untenable. After the results achieved, it would be nothing short of criminal folly to revert to the unsympathetic and even envious control of the War Office.



A TRI-MOTORED CAPRONI HYDRO-TRIPLANE: It has a span of 31 metres, and the useful load is 2½ to 3 tons. It can be fitted with three 300 h.p. Fiat or Liberty engines, and the speed is 140 kiloms. per hour.



Nurse McMaugh, at the Central Aircraft Co.'s aerodrome at Northolt, where she is taking her ticket, goes up with Mr. Sykes, O.B.E., for a spin. An Australian pupil at the school wishing her a good trip. Inset: A snap of the above pair in the air, taken from a sister Central Aircraft 'bus.

Let us trust that "Ex-Chaplain" will think again before urging a course of the merits of which he must be entirely ignorant; and if there is reason for discussion of a change, let the Government consult those, and those only, to whom the present high standard and repute of our Air Service is entirely due.

THERE is good reason for giving these diverse views at length. For years back *FLIGHT* has been rubbing in most of the points made by the second correspondent, long before the events as they have now materialised. It is, therefore, refreshing to have these facts so ably summarised from an independent source. As we started by suggesting, Gen. Seely's resignation cannot help but bring about good and we entirely sympathise with him in having taken such a drastic step in order to bring the limelight upon so very corrosive a sore in our national and Imperial efficiency.

It would appear to be almost as difficult a problem to place wrecked aircraft at sea in its proper category as the railway porter experienced when he was confronted with the query as to freight classification for a tortoise. "Cats is dogs, rabbits is dogs, dogs is dogs, but a tortoise is a hinsect, so there ain't no ticket for that." So with a view to a solution, the Fisheries Division of the Board of Agriculture and Fisheries (*why* this body is equally a bit of a problem) has been discussing with the Air Ministry questions relating to the salvage of aircraft at sea. The result of these discussions is that a section dealing with salvage will be introduced in the Air Navigation Bill to provide that aircraft on the water shall be regarded for salvage purposes as shipping. Aircraft in need of assistance will become "wrecks" within the meaning of the Merchant Shipping Act.

In order to get the law settled, and so save many questions and much expense, it has been decided to send the first case of salvage of civil aircraft for test to the courts, probably the Admiralty Court.

MANY of the "exhibits" at the British Science and Key Industries Exhibition, organised at Glasgow by the Corporation, and opened by Sir Charles A. Parsons, on Monday, matters aviation are well to the fore. Wireless telegraphy and telephony also hold a prominent place, both such important allies to the navigation of the air. The idea of these "key" industries going the rounds of the chief cities is distinctly practical.

By way of marking the landing in January last, by aeroplane, of Vedrines, now he has passed away, on the roof of the Lafayette Gallery in Paris, a monument has been erected at the spot where this remarkable pilot alighted. The experiment was an unnecessarily hazardous one, but it emphasises the possibilities of the not over-far future in the direction of roof-landing in cities under reasonable conditions.

FROM the latest reported exploits of d'Annunzio, we were not far out in our surmise a few weeks back that we thought he was unduly optimistic in putting the start of his flight to Tokio at the elapse of a month, and *after* the Fiume chaos, had been finally smoothed out.

How the untutored tribes in Afghanistan and elsewhere view the might of Great Britain, which they have the audacity to dispute, is fairly exemplified in the astonishment of the Wazir-Mahsuds the other day, when a little batch of about fourteen fighting planes manœuvred in war formation over the "pow-wow" at which Gen. Climo launched his terms and ultimatum. The Mahsuds thought the maximum number of planes we possessed was *four*.

ONE of the latest acts of the Prince of Wales in America before he embarks again for Blighty was the investiture which he held at Washington. After the honours to Admiral Benson and other prominent Americans, the Prince conferred a number of Crosses on members of the American Flying Corps.

THE London Museum, which has recently been re-opened to the public, is one of the least known, but possibly one of the most interesting museums in London. It now comprises numerous exhibits of special interest to all concerned in aviation and the anti-aircraft defences of London which are well worth a visit. There are some photos of air-raid damage by Zeppelins and Gothas which have probably not been seen by the public before, and sundry other relics dealing with the same exciting period in our history. In the basement, which contains many of the most attractive features of the whole museum, will be found a collection of rare old prints and engravings of aeronautical events. Contemporary illustrations of early balloon ascents are now becoming very scarce and are eagerly sought after by collectors, and the specimens shown at the London Museum include some remarkable pictures of ascents in the London district. Among the photos of homes of famous persons we noticed the rooms occupied by Gustav Hamel at Brook Street.

THE ROYAL AIR FORCE

London Gazette, November 11

The following officers have been granted short service commns. in the ranks stated, with effect from Nov. 11. They will retain their seniority in the substantive rank last held by them prior to the grant of the short service commn.

In the case of officers now gazetted Flying Officer from Pilot Officer, seniority will date from the date of *Gazette*:-

Squadron Leaders.—T. S. Impey (A.), J. C. M. Lowe (A.P. (T.)).
Flight Lieutenants.—C. B. Belt, M.C., M.B.E., D.C.M. (Ad.), V. Greenwood (T.), B. D. Hobbs, D.S.O., D.S.C. (S.), H. J. Payn (A.), E. M. Pizey (A.), H. C. Todd (A.), W. D. Wain (T.), R. B. Waite, M.B.E. (S.O.), F. C. Wilkinson (A.P. (T.)), F. R. Williams (T.).

Flying Officers.—E. A. Burridge (Ad.), W. Jones (A.), W. M. Long (Ad.), D. S. C. Macaskie (T.), W. G. MacD. Nicholl (T.), E. P. Terry (T.), E. A. Tottle (T.), B. Turner (A.P. (T.)), L. A. Walters (A.).

Observer Officer.—W. J. Umpleby.
Flying Officers (from Pilot Officers).—E. F. Elliott (Ad.), V. S. Holbrook (T.), A. B. Langridge (Ad.), E. J. Newman (T.), C. H. N. Nunn (T.), T. Thomson (T.).

It is intended that officers employed as Stores Officers or on "Q" duties shall belong to the new Stores Branch when formed. Officers appearing in this *Gazette* who are at present so employed will be transferred to this Branch on its formation and will accept these short service commns. on that condition. They will then come on to the rates of pay of that Branch, but will meantime be permitted to draw the higher rates laid down in the new scheme for officers on the General List. An officer posted to the Stores Branch on its formation will then have the option of declining his short service commn.

The notifications appearing in the *Gazettes* of the dates indicated below, appointing the following officers to short service commns., are cancelled:—**Flight-Lieut.** T. L. Williams, M.C. (Ad.), **Flying Officer** E. R. Bruce (A. and S.), **Flying Officer** A. H. Burmann (S.O.), **Flying Officer** J. W. Milner (A.), **Flying Officer** R. N. Walter (Ad.); Sept. 12. **Flight-Lieut.** T. K. Young (T.), **Flying Officer** D. B. Robertson (A.); Sept. 16. **Sqdn. Leader** H. G. Atkinson, O.B.E. (T.), **Flight-Lieut.** E. R. Pritchard (A. and S.), **Flight-Lieut.** P. C. Purser, M.C. (A.), **Flying Officer** J. Burden (T.), **Flying Officer** E. H. Colman (A.), **Flying Officer** C. S. Fulton (S.O.), **Flying Officer** L. W. R. Grubb (A.); Oct. 24.

The notification appearing in *Gazette* of Oct. 28 appointing **Sqdn. Leader** J. C. M. Lowe to a permanent commn is cancelled.

Permanent Commissions

The notification in *Gazette* of Aug. 1 appointing the following officers to permanent commns. is cancelled:—**Maj.** E. T. Newton-Clare, D.S.O. (A.), **Maj.** V. A. A. Albrecht, O.B.E., M.C. (A.), **Maj.** F. F. Minchin, D.S.O., M.C. (A.), **Capt.** A. F. Jacob, D.S.O. (A.), **Capt.** G. L. Hunting (T.), **Lieut.** R. G. St. John, D.S.C. (O.), **Lieut.** J. H. Rutherford (T.), **Lieut.** F. Thompson (A.), **Lieut.** A. T. Laing (Ad.).

The notification appearing in *Gazette* of Aug. 22 appointing **Lieut.** J. W. D. Leigh, M.C. (A.), to a permanent commn., is cancelled.

The Christian names of **Sqdn. Leader** John Claude Malcolm Lowe are as now described, and not "John Cecil Mansfield," as stated in *Gazette* of Oct. 28.

The following temp. appointment is made at the Air Ministry:—

Staff Officer, 3rd Class.—(P.)—**Flight-Lieut.** R. Addenbrooke-Prout, O.B.E., M.C.; Oct. 21.

The following temp. appointments are made:—**Staff Officers, 3rd Class.**—(P.)—**Flight-Lieut.** F. B. Beauman; May 31. (T.)—**Lieut.** J. W. Sawyer; April 11, and to be actg. **Capt.** until April 30 (substituted for notification in *Gazette* of July 22).

Flying Branch

Sec. Lieuts. to be **Lieuts.**:—(Hon. **Lieut.**) J. S. Arthur, M.C.; April 15, 1918. A. L. Wilcox; Oct. 6, 1918.

Sec. Lieut. D. H. Woodhouse (late Gen. List, R.F.C., on prob.) is confirmed in rank as **Sec. Lieut.** (A.); July 28, 1918.

Sec. Lieut. E. Wallace (late Gen. List, R.F.C., on prob.) is confirmed in rank as **Sec. Lieut.** (O.); Aug. 8, 1918 (since killed).

The following relinquish their commns. on ceasing to be employed:—**Sec. Lieut.** (Hon. **Lieut.**) R. W. V. Midlane (K.R.R.C.); May 21. **Capt.** W. T. F. Holland, A.F.C. (Lieut., Lancers); June 5. **Lieut.** J. C. Preston (Lieut., Bedford R.); Aug. 6. **Lieut.** C. L. Munday, M.C. (Lieut., R. Fus.); Oct. 6. **Sec. Lieut.** (Hon. **Lieut.**) R. A. Adams (Lieut., C. Ont. R.), **Lieut.** (Hon. **Capt.**) F. H. Eberti (Capt., R.G.A.), **Lieut.** R. A. Grosvenor, M.C. (Capt., Dragoon Gds.), **Lieut.-Col.** A. T. L. Nye (Paym.-Com., R.N.); Oct. 16. **Lieut.-Col.** T. A. E. Cairnes (Capt., Dragoon Gds.); Oct. 17. **Maj.** E. H. M. O'Farrell (Maj., R. Irish Fus.); Oct. 18. **Lieut.** B. D. Collison-Cox (Lieut., N. Staffs. R.); Oct. 21. **Lieut.** C. M. J. Barrington (Lieut., D.L.I.), **Lieut.** W. C. Thompson (Lieut., R.G.A.); Oct. 23. **Lieut.** C. T. Armitage (Lieut., Lab. Corps), **Sec. Lieut.** J. H. B. Rygate (Sec. Lieut., Dragoon Gds.), **Capt.** R. J. G. Temple (Lieut., R.G.A.); Oct. 28. **Sec. Lieut.** P. S. Blowey (Sec. Lieut., Devon R.); Oct. 30. **Lieut.** A. H. W. Fleming (Lieut., Norfolk R.), **Sqdn. Leader** (actg. **Wing Com.**) R. Hall, O.B.E. (Capt., Welsh Fus.); Nov. 1.

(Then follow the names of 158 officers who are transfd. to the Unemployed List under various dates.)

The following **Lieuts.** relinquish their commns. on account of ill-health caused by wounds, and are permitted to retain their rank:—R. M. Montgomery (R.A., T.F.); Oct. 31. H. C. Deeks; Nov. 5.

Lieut. J. G. W. March (Sec. Lieut., R. Warwick R.) resigns his commn.; Nov. 12.

Sec. Lieut. (Hon. **Capt.**) D. Gale relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain the rank of **Capt.**; Nov. 5.

Lieut. W. J. Gleason is dismissed the service by sentence of General Court-martial; July 18.

The notification in *Gazette* of May 16 concerning **Lieut.-Col.** G. C. St. P. De Dombaste is cancelled.

The notification in *Gazette* of May 16 concerning **Sec. Lieut.** W. J. McDonough is cancelled.

The notification in *Gazette* of May 9 concerning **Lieut.** J. A. Harkin is cancelled.

The notification in *Gazette* of Oct. 21 concerning **Lieut.** C. L. Munday, M.C. (Lieut., R. Fus.) is cancelled.

Administrative Branch

Sec. Lieut. C. P. Sisley to be **Lieut.** (since relinquished his commn.); May 13, 1918 (substituted for notification in *Gazette* of May 6).

Lieut.-Col. (actg. **Col.**) W. P. Alexander relinquishes his commn. on ceasing

to be employed, and is permitted to retain rank of **Col.**; Sept. 1 (substituted for notification in *Gazette* of Aug. 29).

Lieut.-Col. F. H. G. Playfair (Lieut.-Col., T.F. Res.) relinquishes his commn. on ceasing to be employed; Nov. 1 (substituted for notification in *Gazette* of Nov. 4).

(Then follow the names of 45 officers who are transfd. to the Unemployed List under various dates.)

The following **Lieuts.** relinquish their commns. on account of ill-health, and are permitted to retain their ranks:—R. T. Jones, D.F.C. (caused by wounds), C. J. Stanfield (contracted on active service); Nov. 5. **Sec. Lieut.** F. G. Laing relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; Nov. 5.

Technical Branch

Sec. Lieuts. to be **Lieuts.**:—W. W. Scott-Davidson; April 2, 1918, F. A. Dickinson (since demobilised); Oct. 8, 1918. J. E. Tyrrell; March 8.

Sec. Lieuts. to be **Lieuts.**, without pay and allowances of that rank:—P. W. Renshaw; June 8, 1918 (substituted for notification in *Gazette* of Dec. 24, 1918). R. M. Langley; Jan. 16. H. A. Chapman (since demobilised); Jan. 27. W. T. O. Cosgrave; May 26.

Pilot Officer H. P. Strong to be **Flying Officer**; Oct. 1.

Pilot Officer F. H. Davis to be **Flying Officer**, without the pay and allowances of that rank; Oct. 1.

(Then follow the names of 54 officers who are transfd. to the Unemployed List under various dates.)

The initials of **Pilot Officer** (Hon. **Flying Officer**) J. G. Dyson are as now described, and not "J. C.," as stated in *Gazette* of Oct. 21.

The notification in *Gazette* of Aug. 27, 1918, concerning **Lieut.** R. H. Whittingham is cancelled.

Medical Branch

(5 Officers transfd. to the Unemployed List.)

Memoranda

Sec. Lieut. R. F. B. Campbell (late Gen. List, R.F.C., on prob.) is granted the hon. rank of **Lieut.**; April 1, 1918.

The following cadets are granted hon. commns. as **Sec. Lieuts.**:—180398 O. G. Williams; Jan. 7. H. 71746 A. J. Smith; Feb. 7. 137769 L. Mawer; March 15. 35646 J. A. Crawford; March 26. 15587 H. Cheesman; July 31.

The following prob. **Flight Officers** are granted hon. commns. as **Sec. Lieuts.**:—F. L. S. Allen; Nov. 19, 1918. E. W. Bettany; Jan. 25. W. Anelay; Jan. 31. B. D. Bowyer; Feb. 13. C. F. Byrd; Feb. 19. C. P. Abbott; March 31. F. J. C. Bush; April 15. A. Barron; May 8. R. G. Agnew; June 5.

The following relinquish their commns. on ceasing to be employed:—**Temp. Hon. Lieut.** J. Hay; March 16. **Maj.** H. F. Towler (Sub-**Lieut.** (actg. **Lieut.**), R.N.K.); Oct. 25).

(5 officers transfd. to the Unemployed List.)

London Gazette, November 14

The notification in *Gazette* of Aug. 1, appointing **Capt.** W. R. Read, M.C., A.F.C., to a permanent commn., is cancelled.

The following temp. appointments are made at the Air Ministry:—

Dep. Director, 2nd Class.—Group **Capt.** I. M. Bonham-Carter, O.B.E., from **Dep. Dir.**, 1st Cl.; Nov. 1.

Staff Officer, 3rd Class.—(Air.)—**Flying Officer** H. C. Pyper; Oct. 29.

The following temp. appointment is made:—

Staff Officer, 1st Class.—(Air.)—**Wing Com.** F. W. Bowhill, D.S.O.; Oct. 30.

Flying Branch

Wing Com. R. P. Ross, D.S.O., A.F.C., to be **Wing Com.** (A. and S.), from (S.O.); Oct. 22.

Wing Com. R. C. M. Pink to be **Wing Com.** (A.), from (S.O.); Nov. 1.

Sqdn. Leaders to be actg. **Wing Coms.** (without pay and allowances of that rank) whilst employed as **Wing Coms.** (A. and S.):—R. J. Bone, D.S.O., to Oct. 17, L. Tomkinson, to Oct. 2; Aug. 1.

Capt. M. R. Buck and is graded for purposes of pay and allowances as **Maj.** whilst employed as **Maj.** (S.); May 1.

Lieut. H. J. Gibson is graded for purposes of pay and allowances as **Capt.** whilst employed as **Capt.** (A.); from May 1 to Aug. 2.

Flying Officer (actg. **Flight-Lieut.**) G. N. Trace relinquishes the actg. rank of **Flight-Lieut.** on ceasing to be employed as **Flight-Lieut.** (A. and S.); Oct. 3.

Lieut. F. E. E. Villiers to be **Lieut.**, from Unemployed List; May 16, precedence next below **Lieut.** F. S. Reed.

Sec. Lieuts. to be **Lieuts.**:—T. F. Harvey (deceased); April 10, 1918. R. H. Owens; Oct. 13, 1918. W. E. J. Bloodworth; Dec. 27, 1918 (substituted for notification in *Gazette* of Oct. 21). W. A. Manson; Feb. 1. A. H. Ashtch; July 15.

Sec. Lieuts. to be actg. **Lieuts.** whilst employed at **Lieuts.** (O.):—A. F. Adams, to Oct. 2, J. F. Mehigan, to Oct. 3; May 1.

The following relinquish their commns. on ceasing to be employed:—**Sec. Lieut.** E. Brittain; April 20, 1918. **Sec. Lieut.** (Hon. **Lieut.**) J. S. Batty (Lieut., R.F.A.); March 21. **Sec. Lieut.** W. J. McDonough; May 3. **Lieut.** E. L. Brown (Lieut., Warwick R.); Aug. 20. **Maj.** A. V. Squire (Paymaster **Lieut.-Com.**, R.N.); Oct. 10. **Lieut.** G. W. Panter, M.B.E. (Lieut., R.I. Rif.); Oct. 15. **Lieut.** G. Malone (Lieut., R.I. Regt.); Oct. 16. **Lieut.** (Hon. **Capt.**) M. M. Parkenham (R.A.S.C.); Oct. 17. **Maj.** C. A. A. Hiatt, M.C. (Lieut., Norf. R.); Oct. 20. **Lieut.** F. O. Cave, M.C. (Lieut., Rif. Brig.); Oct. 22. **Lieut.-Col.** A. Ross-Hume, O.B.E. (Maj., Camer. Scot. Rif.); Oct. 24. **Capt.** G. B. McClure, O.B.E. (Capt., Black Watch); Oct. 25. **Maj.** R. Grey (Capt., Gren. Gds.); Nov. 8.

(Then follow the names of 94 officers who are transfd. to the Unemployed List under various dates.)

Lieut.-Col. Hon. C. M. P. Brabazon, O.B.E. (Maj., Irish Gds.), relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain rank of **Lieut.-Col.**; Oct. 22 (substituted for notification in *Gazette* of Oct. 24).

The following **Lieuts.** relinquish their commns. on account of ill-health, and are permitted to retain their rank:—E. E. C. Pickwood; Nov. 6. J. A. F. Sinclair (contracted on active service); Nov. 7.

Sec. Lieut. A. T. Rose relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; Nov. 7.

The notification in *Gazette* of June 27, concerning **Capt.** G. A. Revington, is cancelled.

Administrative Branch

Flight-Lieut. L. M. Boddam-Whetham to be **Flight-Lieut.**, from (S.O.); Aug. 12 (substituted for notification in the *Gazette* of Aug. 29).

Flying Officer (actg. **Flight-Lieut.**) H. B. Dakin relinquishes the actg. rank of **Flight-Lieut.** on ceasing to be employed as **Flight-Lieut.**; Oct. 4.

Capt. L. M. Boddam-Whetham relinquishes his commn. on ceasing to be employed, from (S.O.); Aug. 28 (substituted for notification in the *Gazette* of Oct. 21, wherein this officer was shown under Flying Branch).

(Then follow the names of 26 officers who are transfd. to the Unemployed List under various dates.)

Maj. A. Brind relinquishes his commn. on account of ill-health contracted on active service, and is permitted to retain his rank; Nov. 6.

Lieut. A. L. Hitt (Lieut., D. of Cornwall's L.I.) resigns his commn.; Nov. 15.

The notification in the *Gazette* of Aug. 22 concerning Lieut. J. Edwards is cancelled.

Technical Branch

Sec. Lieuts. to be Lieuts.:—W. C. Francis; May 30. C. S. Goode; July 7 (substituted for notification in *Gazette* of Oct. 14). G. C. Walsh; July 14.

Sec. Lieut. (Hon. Capt.) W. E. Humphreys to be Lieut.; April 2, 1918, without the pay and allowances of that rank prior to Sept. 17, 1918.

Sec. Lieut. A. N. Goodwin to be Lieut., without the pay and allowances of that rank; Jan. 19.

Pilot Officer T. G. Brice to be Flying Officer, without the pay and allowances of that rank; Oct. 1.

W. J. Collins (late Deputy Commissary and Hon. Capt., Indian Army) is granted a temp. commn. as Sec. Lieut. (Grade A), without pay and allowances; April 1, 1918 (and to be Hon. Capt.).

Pilot Officer E. C. Farman to be Pilot Officer (Grade B.), from (Ad.); Oct. 18.

(Then follow the names of 30 officers who are transfd. to the Unemployed List under various dates.)

Capt. A. Belton, O.B.E. (R. Fus.), relinquishes his commn. on account of ill-health contracted on active service, and is granted rank of Maj.; Nov. 4.

Capt. C. Gordon Riley relinquishes his commn. on account of ill-health caused by wounds, and is permitted to retain his rank; Nov. 7.

Lieut. S. C. Tucker relinquishes his commn. on account of ill-health, and is permitted to retain his rank; Oct. 18.

The rank of Lieut. H. A. Chapman is as now described, and not Sec. Lieut. as stated in *Gazette* of March 28.



AVIATION IN PARLIAMENT

Senior Officers of the R.A.F.

MAJ. WARING asked the Under-Secretary of State to the Air Ministry whether there are in command of the Air Force one marshal of the air and five air vice-marshals; if so, will he state what work can be found to keep these officers employed; and whether the command organisation and administration could be performed efficiently by fewer officers of high rank?

Maj.-Gen. Seely: The reply to the first part of my hon. and gallant friend's question is that there is no marshal of the air at the present time, but that there are one air marshal and five air vice-marshals corresponding to one Lieut.-Gen. and five Maj.-Gens. These officers are fully employed, and I do not consider that this small number of senior officers is excessive for so vitally important a service.

Training and Staff, Egypt

MAJ. WARING asked the Under-Secretary of State to the Air Ministry whether it is the intention to recommence flying training in Egypt; and, if not, what reduction it is proposed to make in the administrative staffs and units in that country, in view of the fact that only five active flying squadrons are now employed in that command?

Maj.-Gen. Seely: It is hoped to recommence flying training in Egypt, but a final decision cannot be taken until the strength and constitution of the after-war Air Force is settled. The administrative staff was reduced early this year to what is considered necessary to deal with the units under the command of the Air Officer Commanding, Middle East, of which command Egypt forms a part.

Sherburn-in-Elmet and Tadcaster Aerodromes

MAJ. LANE-FOX asked the Under-Secretary of State to the Air Ministry how many machines have gone up from the aerodromes at Sherburn-in-Elmet and at Tadcaster during the past three months; how the cost of these aerodromes has been justified; by what date it is expected that they will be closed; and whether they will be demolished or sold?

Maj.-Gen. Seely: I am obtaining the information asked for in the first part of this question. In regard to the second part, as I informed my hon. and gallant friend on October 30, both these aerodromes are being used for the storage of standard-type machines and for civil aviation. Other accommodation is not at present available for the storage of these valuable machines, which would deteriorate if not constantly attended to. Tadcaster is also the station of a headquarters unit. In regard to the third part, instructions have been given to close down both stations when cleared of stores. Sherburn-in-Elmet will, it is expected, be cleared by March 31 next and Tadcaster by the end of this year. In regard to the fourth part, when evacuated by the R.A.F. both stations will be handed over to the Disposal Board for sale.

R.A.F. at Fermoy Camp

MR. GRUNDY on November 5 asked the Under-Secretary of State to the Air Ministry whether he is aware that the 106th Squadron, composed to a large extent of young lads, is still under canvas at Fermoy, county Cork, with only boards to sleep upon, and blanket covering; and whether, in the interests of the health of these lads and in view of the cold weather, he will consider the possibility of utilising the present surplus huts and other stores?

Maj.-Gen. Seely: No. 106 Squadron was disbanded on October 8 last. If, however, the hon. gentleman is referring to the detached flight of No. 105 Squadron now stationed at Fermoy, arrangements were made some weeks ago to accommodate this flight in buildings lent by the Army.

Gratuities and Deductions for Debt

MR. HOGGE asked the Under-Secretary of State to the Air Ministry whether deductions for debt can be made from airmen's war service gratuities; and, if so, why the practice is different from that obtaining at the War Office, where no such deductions are made?

Maj.-Gen. Seely: The Order granting war gratuities to airmen provides that, except in the case of airmen serving on a normal Service engagement, the gratuities shall be held liable to meet any public claim, Service debt, or Service claim.

Airship Sheds, Ea Fortune

LIEUT.-COL. SIR JOHN HOPE asked the Under-Secretary of State to the Air Ministry whether the steel airship shed constructed at East Fortune for R 34, at a cost of £250,000, is to be moved to Howden, or how this shed and five smaller airship sheds at East Fortune are to be disposed of?

Maj.-Gen. Seely: It is not the intention to move to Howden Airship Station the rigid airship shed at East Fortune in which the R 34 is at present

The notification in *Gazette* of Sept. 5 concerning Lieut. E. A. Baker, M.C. is cancelled.

Medical Branch

Flight-Lieut. G. Cranston to be actg. Sqdn. Leader whilst employed as Sqdn. Leader; Sept. 4.

Flying Officers to be Flight-Lieuts.:—S. A. Clark; Sept. 25. S. R. E. Davies, J. Gorsky, V. I. Levy, K. F. D. Waters; Nov. 1.

(2 officers transfd. to the Employed List.)

Capt. Q. Moir Gray relinquishes his commn. on account of ill-health, and is permitted to retain his rank; Aug. 26.

Dental Branch

Flying Officer F. B. Stradling to be Flight-Lieut.; Oct. 30.

Chaplains' Branch

(1 officer transfd. to the Unemployed List.)

The following Prob. Flight Officers are granted hon. commns. as Sec. Lieuts.:—F. H. Dawson, L. J. Empson; Nov. 22, 1918. R. P. France; Dec. 2, 1918. F. W. Ings; Jan. 16. D. E. Huck; Feb. 27. J. S. Mackinnon; March 9. A. E. Blaxill, W. N. Errington; April 15. O. Drew; April 30. J. W. Maidment; June 26.

Lieut. B. D. Bellamy (Essex R.) relinquishes his commn. on ceasing to be employed; Oct. 31.

(5 officers transfd. to the Unemployed List.)

The notifications appearing in *Gazettes* of dates indicated below, appointing the following officers to short service commns., are cancelled:—Flight-Lieut. L. P. Ferris-Scott (Ad.), Flight-Lieut. N. Keeble, D.S.C. (A.), Flying Officer F. G. Brookman (T.), Flying Officer H. H. Sharp (T.); Sept. 12. Flight-Lieut. L. O. Brown, D.S.C., A.F.C. (A. and S.), Flight-Lieut. D. O. Mulholland, A.F.C. (A.), Flight-Lieut. P. D. Robertson, A.M. (T.), Flying Officer C. Rapley (T.); Sept. 16. Flight-Lieut. P. E. L. Gethin, A.F.C. (A.), Flying Officer H. L. Rough, D.F.C. (A.); Oct. 10. Flying Officer S. Dawson, D.F.C. (A.), Flying Officer L. G. Morris (T.); Oct. 24.

The Christian names of Sqdn. Leader John Claude Malcome Lowe (A.P. T.) are as now described, and not "John Cecil Mansfield," as stated in *Gazette* of Nov. 11, appointing this officer to a short service commn.

housed, and to which I assume my hon. and gallant friend refers. The cost of this shed was £160,000. This shed and the other two (not five) small airship sheds on the station, if not required for the purposes of civil aviation, are to be handed over to the Disposals Board.

R.A.F. Stations to be Retained

SIR J. HOPE asked the Under-Secretary of State to the Air Ministry whether it has now been finally decided which Air Force stations are to be permanently retained; and whether he has stopped all construction work both on those air stations which are to be abandoned and also on those air stations concerning which a decision has not been arrived at?

Maj.-Gen. Seely: The answer to the first part of my hon. and gallant friend's question is that the retention of certain stations has been decided upon and that in the case of certain other stations a decision is awaiting the final settlement of the peace basis of the R.A.F. The reply to the remainder of the question is that construction work has been stopped on all stations other than those which it is definitely intended to retain except in cases where a small amount of work has been necessary for the safety and preservation of buildings partially completed.

Charlton Rope Works

MR. CROOKS asked the Under-Secretary of State to the Air Ministry whether he is aware that the R.A.F. is using as stores the rope walk of Messrs Charlton Rope Works, Anchor and Hope Lane, Charlton, S.E.7, thereby preventing the firm from carrying out orders which would enable them to work their present staff full time and to employ immediately an increased staff; and whether, in view of the unemployment at present existing in the Woolwich district, he is prepared to order the immediate release of these premises?

Maj.-Gen. Seely: I am aware that the Charlton Rope Works is being used as a depot for mechanical transport stores, which will be moved to Kidbrooke as soon as space is made available by disposal of surplus stores. As far as can be estimated at the present time, it should be possible to hand the rope walk over to the firm in February of next year; I can assure my right hon. friend that there shall be no avoidable delay.

Anti-Aircraft Station, Hyde Park

MR. WILSON-FOX on November 6 asked the First Commissioner of Works whether he is satisfied that the anti-aircraft station near the Serpentine, in Hyde Park, is still required for purposes of defence against hostile aircraft; and, if it is not so required, if he will order the immediate removal of this encroachment upon space which is needed for purposes of public recreation?

Mr. Parker: The buildings of the station have, I understand, now been sold by the Disposals Board, and will be removed as soon as possible and the land restored to the Park.

R.A.E. Farnborough Apprentices

VISCOUNT WOLMER, on November 10, asked the Under-Secretary of State to the Air Ministry whether he is aware that a number of lads are being discharged from the Royal Aircraft Establishment, Farnborough, before they have completed their apprenticeship; and whether, in view of the fact that there are no other engineering works in the neighbourhood, he will take steps to assist them to complete their apprenticeship in other engineering works in the country so that the time that they have already spent and the knowledge that they have already acquired is not wasted?

Mr. Kellaway: I have been asked to answer this question. No lads of the apprentice class (excepting nine who were dispensed with in June last as unsuitable for engineering training) have been discharged, and, in spite of the drastic reduction in the personnel of the Royal Aircraft Establishment, I hope that the necessity for discharging any lads of that class will be avoided. The remainder of lads discharged since the Armistice, 195 in number, have been selected only from those who were originally engaged as office boys, messengers, etc., but who were subsequently drafted into the shops and given an opportunity of learning a trade.

Ordnance Survey and Aerial Photography

LIEUT.-COL. MOORE-BRABAZON asked the Parliamentary Secretary to the Board of Agriculture what steps, if any, have been taken to utilise the experience obtained during the War in connection with aerial photography for mapping purposes towards assisting the Ordnance Survey work in this country, having regard to the fact that many maps are now out of date?

SIR A. BOSCAWEN: The value of aerial photography for the purpose of map-making in the theatre of war is fully appreciated by the Ordnance Survey,

and its application to peace surveys is being carefully studied, but at present the process is generally more expensive than normal methods, and less accurate. The Ordnance Survey has full information on the subject, and is in touch with those who carried out air surveys on the Western Front and elsewhere. Some of these officers are now on the Ordnance Survey staff.

Air Ministry Finance

ASKED by Sir F. Banbury, on November 10, what suggestions of the Select Committee of National Expenditure he proposes to adopt, Mr. Chamberlain, the Chancellor of the Exchequer, said that with regard to the presentation of the 1919-20 Air Ministry Estimates to Parliament before the consent of the Treasury had been obtained, definite instructions have been given that in future no Estimates shall be presented to Parliament before the consent of the Treasury has been obtained.

With regard to the strengthening of the position of the Assistant Financial Secretary, Mr. Chamberlain explained that the Financial Secretary to the Treasury had summoned periodical meetings of the financial officers of other Departments, and was considering with them methods for strengthening the hands of the financial officers within their own Departments.

The position of the Assistant Financial Secretary at the Air Ministry was similar to that of the Assistant Financial Secretary at the War Office, each having independent power of criticism and of appeal, if necessary, to the Council through the Finance Member.

Air Service

CAPT. WEDGWOOD BENN, in the House of Commons on November 12, asked the Prime Minister whether the Government adheres to its pledge to maintain the unity of the Air Service?

Mr. Bonar Law: The answer is in the affirmative.

Resignation of Maj-Gen. Seely

MAJ-GEN. SEELY (speaking from the Front Opposition Bench): The House generally wishes to know the reason for the retirement of any of its members from the Ministry, and in a very few words I will endeavour to tell the House the reasons which have impelled me to resign the high position which I have hitherto held. When the Government was first formed the Prime Minister asked me to go to the Air Ministry, and in a curious phrase, as announced officially, to "preside over the Council." It was a curious arrangement in that the right hon. gentleman opposite (Mr. Churchill) was to hold the seals of both offices as Secretary of State for both War and Air. It had the obvious anomaly that the Admiralty was left out of the business altogether. But I accepted it because I had a very deep interest in the Air business for a very long time. Indeed, I was charged by Mr. Asquith, then Prime Minister, with the task of being President of the Committee of Imperial Defence, which laid the foundations of our present Air Service. Also we were not then at peace with Germany, and I thought it my duty to take any office in which one could be of service. It involved, obviously, the dangers of dual control. Dual control is a dangerous thing anywhere, and, as my right hon. friend the Secretary of State for War would be the first to admit, it is peculiarly dangerous in the air. Nevertheless, I undertook the duty gladly, and endeavoured to work it, but it very soon became apparent that the thing would not work, not for any personal reason, but because by actual fact and by statute the only man who can preside over the council is the Secretary of State. He cannot divorce himself from his responsibility, even if he wishes to do so. All questions such as these, submissions to the Sovereign, memoranda to the Cabinet, dealings with the responsible heads of other Government Departments, where any question of controversy arises, and, above all, on questions of high policy, must be the duty of the Secretary of State, and of him alone.

As soon as this became apparent I informed the Leader of the House, through my noble friend the member for Chichester (Lord Edmund Talbot) that the arrangement was bound to be inefficient and wasteful and that I would ask for a change. He begged me to wait until after peace was made with Germany. I accordingly did so. When the Prime Minister returned in July, I then put the case before him, and in very precise terms stated that the present arrangement, for the reasons I have shortly given, was one which I thought was not in the interests of the State, and, above all, inimical to the interests of the Air Service, and I asked for a change. The decision was delayed, first owing to the Prime Minister's absence in France, having a much-needed rest, and then owing to the railway strike. The matter came up finally for decision twelve days ago. The Prime Minister treated me with the utmost courtesy and consideration, begged me to reconsider my position, and finally told me that he had decided on the present plan after due consideration, and that he did not propose to abandon it. The only possible

course for me to take, as I am sure the House will agree, whoever of the two of us was right, was for me to resign and be no longer responsible for an arrangement which I was convinced was wasteful and inefficient.

There is no personal question involved. There is no personal question between myself and my right hon. friend the Secretary of State for War. If any man could have done two things he could have done, with his boundless industry. I have never met so industrious a man—and with his care for the Air Service as a whole, than whom it has had no better friend. If any man could have done it he would have done it, but the thing is obviously impossible. The War Office is a whole-time job, as I have reason to know, and the duty of the Secretary of State for Air—this service, with its vast possibilities—is a whole-time job too. A man cannot be in two places at once, even if he is the Air Minister. The very fact that the offices are distinct, that the Air Ministry is a distinct office, makes it quite impossible for the responsible head of one to be also the responsible head of the other. Still less is there any personal difficulty in the Air Ministry itself. I can say truly, and I have had some experience of public life, that never has a man been so faithfully served by loyal and devoted servants as I have been in my position by the members of the Air Council, and especially by Sir Hugh Trenchard and Gen. Sykes, whom I think the State is fortunate in having at the head of their respective Departments. The issue involved is very clear and very definite, and involves questions of vast importance. By deciding as the Prime Minister has done that the Air Ministry is to receive its guidance from its responsible head, from a man who can only give a fraction of his time to it, it seems to me that three certain consequences follow. First of all, because such a man, however industrious, cannot possibly give enough time to enable business to be efficiently conducted, and it must mean delay, and delay must mean waste—waste of time, waste of energy, waste of money. Secondly, the fact that the Admiralty is left out of the business must make it difficult to work in with that great Department. How can the First Lord of the Admiralty appeal to the Air Ministry for a proper allocation of funds and a proper allocation of energy, with the infinite possibilities of air effort in regard to the Navy, when all the time he finds that the man he is addressing is the Secretary of State for War?

Over and above all, the result of this decision must be that the Air Ministry is condemned definitely to be a subordinate office and an annexe of the War Office, with results, I am sure, inimical to the good of this country. We must be involved in waste of our commercial possibilities. We must be involved in waste of money on a gigantic scale by not taking advantage of the new inventions and of the new power that the air has given us, to enable us to undertake our great and increased responsibilities throughout the world. If anybody doubts that, let him consider what is the possibility of the air. One aeroplane has saved a war in Afghanistan, and in future aeroplanes may do much more. If it be said, on the plea of economy, that it is wise to combine the offices, then I would say that it is wasteful in the extreme. We cannot possibly hope to maintain our position throughout the world unless we use science to the utmost, and especially the science of the air. I could no longer consent to agree to a plan which I thought would have these fatal results, and I so told the Prime Minister. Believing as I do that the result must be a loss of millions of money and of thousands of lives, I asked him to relieve me of that duty. He may say that he knows better. He may say that this is the old dispute between brigade headquarters and general headquarters, and that from that there can be no appeal. In that case there is no appeal, but here there is an appeal. There is an appeal to this House and to this House, accordingly, I appeal.

Lord Hugh Cecil: In view of the importance of the statement to which we have just listened from the right hon. gentleman, shall we be given an opportunity of discussing the statement, and the circumstances in which it has arisen, and, if so, on what day?

Mr. Bonar Law: It is not usual, I think, for a member of the Government to say anything in reply to a personal statement such as my right hon. friend has made, and I should not have done so except for the noble Lord's intervention. Since I am on my feet, however, I desire to say, on behalf of the Government, how much we regret that our right hon. friend has found it necessary to resign, but at the same time to say that it is simply a question of difference of opinion; he takes one view and we take another. As regards time for discussion, we shall, of course, follow the wishes of the House. I cannot name a day, but if there is a desire for such discussion we shall be very glad to afford the opportunity for it.

Mr. Billing: May I ask whether the right hon. gentleman the Leader of the House can say if it is the policy of the Government to appoint another Air Minister?



Roll of Honour

The War Office announced on November 12 that Capt. St. C. C. TAYLER, M.C., R. Suss. Regt., att'd. R.F.C., who was previously reported missing, is now reported killed.

Deaths

Sec. Lieut. CHARLES CRAWFORD BOUNCKER, R.A.F. (late London Scottish), who was previously reported missing on November 4, 1918, and is now presumed killed on that date, was the only son of Mr. and Mrs. Herbert Bouncker, of The Elms, Parkside, Eltham, and Flotsam, Hythe.

Married

Capt. BERNARD JAMES BEETON, M.B.E., R.A.F., was married on November 11 at St. Peter's, Brighton, to DULCIE, daughter of Mr. and Mrs. TILLSTONE, of Brighton.

To be Married

The marriage arranged between Capt. EDWYN TYRRELL BECK, D.S.O., M.C., Royal Fusiliers, attached R.A.F., and

Miss MOLLIE DUGDALE will take place on Wednesday, December 17, at St. Mark's, North Audley Street.

Items

Maj-Gen. the Right Hon. J. E. B. SEELY, M.P., was received in audience by His Majesty at Buckingham Palace on November 12, upon his resignation as Under-Secretary of State for Air.

All officers of the old staff of the R.A.F. Armament School are invited to a re-union on December 5, at the Connaught Rooms, Great Queen Street, Kingsway. Assemble 19.00; dinner 19.30. Tickets £2 (obtainable up to December 1). Apply Maj. G. E. Smith, 10, Chevening Road, Brondesbury, N.W. 6.

Col. E. R. ENGLISH, D.S.O., late A.P.M. of the London District, has been appointed secretary of the new London Flying Club, Hendon.

The will of Lieut. EVAN LINDSAY PRICHARD, R.A.F., of Cardiff, has been proved at £4,328.

BOY MECHANICS FOR THE ROYAL AIR FORCE

THE Air Ministry has recently instituted a new scheme to secure the entry of well-educated boys for a systematic course of training as skilled craftsmen for service with the Royal Air Force.

Under this scheme boys will be entered between the ages of 15 and 16 years for a period of 10 years' colour service, followed by two years' service in the Reserve. During the first three years they will undergo a course of educational and workshop training at the end of which those who have passed the requisite tests will be promoted forthwith to the rank of leading aircraftmen in one or other of the skilled trades.

To give scope to the more capable and ambitious boys, and to ensure that the Air Force shall secure the full benefit of their ability, a certain number of those who show most promise during their training will be chosen for an additional six months' course of higher instruction, being promoted at once to the rank of corporal. From among these some may be selected for the grant of a commission, and will proceed to the Cadet College for training as flying officers, with the cadets entered by open competition.

There will also be opportunities for promotion to a commission at a later stage to those who show their suitability during their service in the ranks.

In order that the opportunity of competing for entry into the Royal Air Force under these conditions may be brought within the reach of the largest possible number of boys, two distinct methods of admission are being arranged—(1) open competitive examinations, (2) examinations limited to candi-

dates nominated as in every way suitable by the local education authority of their district. A limited number of candidates with Service claims may also be admitted on the nomination of the Air Council subject to their passing a qualifying test only.

The first examination under the scheme will be one for boys nominated by their Local Education Authority, and will take place in December. Full particulars in regard to the arrangements of the grant of nominations for this examination have been circulated to the Local Education Authorities throughout the country, many of whom have already promised their support. As nominations must reach the Air Ministry not later than November 22, prospective candidates should communicate with their Local Education Authority without delay. Boys who are successful in this examination will enter the training centre early in February, 1920.

During the War it was not possible to give enlisted boys more than a few months' training, neither was it feasible to confine the entry only to boys of sufficient intellectual attainments to ensure that they would benefit by a long apprenticeship in R.A.F. technical trades.

The scheme which forms the subject of this communique constitutes an entire departure from the methods imposed by war conditions, and is designed to meet the requirements of the R.A.F. as organised on a permanent basis.

Training centres are consequently being reorganised to deal with this new entry, and the machinery of education, both general and vocational, is being largely increased and developed for the same purpose.

French Aeroplane Service in Chile

COMMANDER V. GUICHARD, chief of the French Aeronautical Mission, has arrived at Santiago in connection with the proposal of French aircraft manufacturers to form a company for running commercial air services in Chile. One of the first lines will be between Santiago and Valparaiso.

Italian Flyer Visits Helsingfors

LIEUT. MADDALENA, the Italian flying officer, on November 10 flew from Stockholm to Helsingfors, a distance of 440 kilometres, in 2 hours and 20 minutes.

Five Killed in Spain

A FARMAN biplane, flying from Pau to Madrid, crashed on the morning of November 17 outside the village of Delamira, near the town of Soria, midway between Madrid and the Pyrenees.

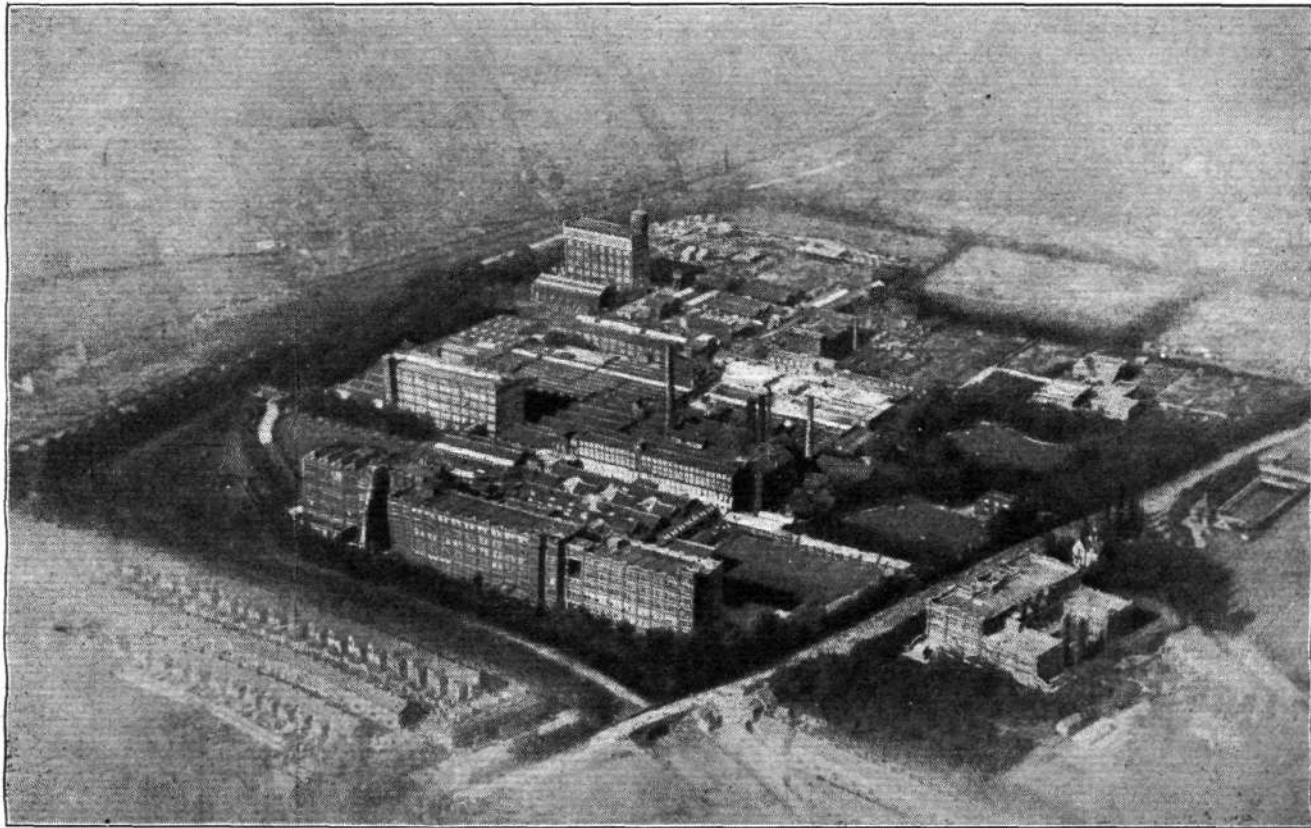
The French pilot Agostini, the Spanish flying officer Capt. Bafios and three mechanics were killed.

'Plane Post in Germany

AN aeroplane carrying the first aerial post from Berlin to Königsberg was reported at the end of last week to have arrived at Königsberg, after a flight of six hours.

German Photogrammetric Project for Brazil

It is reported from Germany that recent experiments have been carried out at Lake Constance with a Schiempflug three-camera outfit, with a view to obtaining data and experience for an ambitious scheme to photograph from the air vast tracts of territory in Brazil. It is proposed shortly to carry out other experiments over Lake Constance by taking aerial photographs with the triple-camera outfit either from a Zeppelin aeroplane or from the airship *Bodensee*.



Where the cocoa of Messrs. Rowntree and Co. is manipulated. Being a photograph from the air by the Aircraft Manufacturing Co., Ltd., of the Rowntree works and Garden Village at York

SIDE-WINDS

WE are informed that Mr. F. H. Arnott has severed his connection with Messrs. Arnott and Harrison, Ltd., which firm will in future be carried on in the same name, under the supervision of Mr. C. A. Harrison and Mr. F. Hornsby Wright as directors.

MESSRS. ROLLS-ROYCE, LTD., beg to announce that owing to the increased cost of production, the price of the Rolls-Royce chassis is fixed at £1,850.

ARRANGEMENTS have been completed for the amalgamation of the business carried on by Mr. Robert W. Paul at New Southgate, London, with the Cambridge Scientific Instrument Co., Ltd. Mr. Paul will join the board of directors, and the manufacture of instruments will be continued both at Cambridge and at New Southgate. Until the end of the year the selling and manufacturing arrangements will be unchanged, but on January 1, 1920, the name of the company will be altered to the Cambridge and Paul Instrument Co., Ltd., and as soon as possible the head office and showrooms transferred to London. It is hoped that the experience gained by the staffs of both firms, when combined, will lead to greater and more rapid advances.

ON Tuesday, November 11, Colonel G. L. P. Henderson, M.C., A.F.C., started from Hounslow Aerodrome for Copenhagen, intending to make the journey in one day. Colonel Henderson's passenger was Mr. Willars Petersen, who was a passenger on the belated Cunarder *Mauretania*, and was due in Copenhagen before the boat landed in England. Mr. Petersen sent a wireless message while in mid-Atlantic to his representative, Mr. Mills, in London, to arrange for an aeroplane to convey him to Denmark. Mr. Mills immediately communicated with the Lep-Aerial Travel Bureau, who arranged with Colonel Henderson to make the flight. Colonel Henderson worked hard with his mechanics to get his 160 h.p. Beardmore-Armstrong-Whitworth tuned up and ready for the flight. Mr. Petersen arrived in London on Monday night and was introduced to Colonel Henderson, and it was arranged that a start should be made at 6 o'clock on Tuesday morning. A splendid flight was made as far as Hamburg, where a landing had to be made owing to a snowstorm on Tuesday evening.

ALTHOUGH many manufacturers of cars are accepting orders only on conditions that the price charged is that ruling at the time of delivery, the makers of the Armstrong-Siddeley six-cylinder car state that all orders which are given to them now will be accepted and executed at the present price—£720 for the complete chassis.

THE Aeronautical Intelligence Bureau, Ltd., has removed to more convenient and commodious offices at 50, Jermyn Street, S.W. 1. They have secured the temporary use of one 'phone number—Gerrard 1060—and it is hoped to have three lines installed shortly.

COMPANY MATTERS

Joseph Owen and Sons, Ltd.

THE directors announce a dividend at the rate of 5 per cent. per annum for the half-year and a further distribution of 3½ per cent., making 8½ per cent. for the year, on the preference shares, and a dividend at the rate of 5 per cent. per annum and a further distribution of 23½ per cent., making 28½ per cent. for the year, on the ordinary shares.

PUBLICATIONS RECEIVED

The Flight Across the Atlantic. The Curtiss Aeroplane and Motor Corporation, New York City, U.S.A.

The Costing Problem. By Edward T. Elbourne. London: The Library Press, Ltd., 26, Portugal Street, W.C.2. Price 4s. 6d. net.

Revue de l'Ingenieur et Index Technique. Vol. XXV, No. 2-3. September-October, 1919. Bureau d'Organisation Economique, 124-126, rue de Provence, Paris. Price 4 fr.

"The Triumph of British Engineering." William Beardmore and Co., Ltd., Glasgow, Scotland.

All About Aircraft of Today. By Frederick A. Talbot. London: Cassell and Co., Ltd. Price 7s. 6d. net.

Catalogues

Broth Electric Lighting and Starting System. Brown Brothers, Ltd., Great Eastern Street, E.C. 2.

Motor Accessories. Brown Brothers, Ltd., Great Eastern Street, E.C. 2.

IMPORTS AND EXPORTS, 1918-1919.

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; and for 1918, see "FLIGHT" for January 16, 1919.

| | Imports. | | Exports. | | Re-Exportation. | |
|---------------|-----------|-----------|----------|---------|-----------------|-------|
| | 1918. | 1919. | 1918. | 1919. | 1918. | 1919. |
| | £ | £ | £ | £ | £ | £ |
| January ... | 49,402 | 555,989 | 24,765 | 57,571 | — | — |
| February ... | 51,941 | 453,822 | 13,545 | 57,972 | — | — |
| March ... | 47,930 | 704,424 | 11,451 | 72,716 | 1,000 | 400 |
| April ... | 33,342 | 97,662 | 10,815 | 25,433 | — | — |
| May ... | 942,866 | 136,631 | 67,224 | 38,428 | — | — |
| June ... | 864,296 | 1,410 | 35,658 | 41,526 | — | — |
| August ... | 566,137 | 67,292 | 71,503 | 60,581 | — | — |
| September ... | 505,160 | 172,192 | 8,033 | 65,349 | 100 | — |
| October ... | 294,835 | 132,243 | 9,166 | 87,635 | — | 500 |
| | 3,355,909 | 2,321,565 | 252,160 | 507,211 | 1,100 | 900 |

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations:—cyl. = cylinder; I.C. = internal combustion; m. = motors.

APPLIED FOR IN 1918

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published November 20, 1919.

- 2,145. A. VAN HESTE. Hangars or garages, etc. (133,975.)
- 11,813. D. M. BOWYER-SMYTH. Propelling and sustaining means for aircraft. (133,978.)
- 12,082. E. R. CATHROP. Parachutes. (133,979.)
- 16,872. H. G. KING. Flying boats, floats, etc. (134,000.)
- 17,426. C. and C. H. BLAIR. Glueing machine for laminating spars, etc. (134,035.)
- 17,904. H. S. EDGAR. Fuse for igniting flares, etc., dropped from aircraft. (134,052.)
- 18,581. H. O. SHORT. Floats for aeroplanes. (134,065.)
- 18,864. R. SROTT. Rotary I.C. engines. (134,073.)

APPLIED FOR IN 1919

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

Published November 20, 1919.

- 1,429. A. V. F. MARION. Magnetic compass. (122,643.)
- 15,220. G. H. FOSTER. Aeronautical apparatus for scientific toy, etc. (134,182.)

If you require anything pertaining to aviation, study "FLIGHT's" Buyers' Guide and Trade Directory, which appears in our advertisement pages each week (see pages xliii, xlv, xlv, and xlv).

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